Migration Guide

Allen-Bradley

1336 REGEN Line Regeneration Package to 8720MC-RPS Regenerative Power Supply Package

Catalog Numbers 1336R, 8720MC

Allen-Bradley • Rockwell Software

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Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence
	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Chapter 3

Parameter Programming

Appendix A

Sequence of Operation

Overview

The purpose of this publication is to assist in migrating a 1336 REGEN Line Regeneration Package to an 8720MC-RPS Regenerative Power Supply Package. This publication contains these three chapters and two appendices:

- **Chapter 1:** Comparison and Selection
  Compares the specifications, fuses and circuit breakers, dimensions and weights, power and control terminals, adapters, and communication capabilities of the 1336 REGEN package to the 8720MC-RPS package.
- **Chapter 2:** Wiring Examples and Components
  Provides wiring examples of the 8720MC-RPS packages.
- **Chapter 3:** Parameter Programming
  Compares the basic programming parameters of the 1336 REGEN package to the 8720MC-RPS package.
- **Appendix A:** Sequence of Operation
  Compares the theory of operation for the sequence of events of the 1336 REGEN package to the 8720MC-RPS package.

Note: The 8720MC-RPS027 model is no longer available.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
1336 REGEN Line Regeneration Package User Manual, publication 1336 REGEN-5.0	Provides layout, sizing, wiring, startup and diagnostic information for the 1336 REGEN line regeneration package, including converter, precharge unit, 1321 line reactor, and line filter (when required).
1336 REGEN Line Regeneration Package Data Sheet, publication 1336 REGEN-1.1	Provides information on features and specifications of the 1336 REGEN line regeneration package.
1336 PLUS, PLUS II, FORCE, IMPACT & REGEN Spare Parts List, publication 1336-6.5	Provides a list of spare parts for the 1336 REGEN line regeneration package.
8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001	Provides information on the installation, wiring, operation, and adjustment of the 8720MC-RPS regenerative power supply.
8720MC Brochure, publication 8720MC-BR-000	Provides information on features and specifications of the 8720MC-RPS regenerative power supply.
Regeneration Overview, What is Regeneration? White Paper, publication 1336R-WP001	Provides an overview of the operational theory of regeneration.
Understanding Regeneration, Regenerative AC Drives White Paper, publication 1336R-WP002	Provides an overview of the operational theory of regeneration for the 1336 REGEN line regeneration package.
System Design for Control of Electrical Noise, publication GMC-RM001	Outlines the practices which minimize the possibility of noise-related failures, and that comply with noise regulations. It gives you an overview of how electrical noise is generated (sources), how the noise interferes with routine operation of drive equipment (victims), and examples of how to effectively control noise.

Resource	Description
1321 Power Conditioning Products Technical Data, publication 1321-TD001	Provides information on power conditioning equipment used in front of AC drives.
PowerFlex AC Drives in Common Bus Configurations Application Guidelines, publication DRIVES-AT002	Provides guidelines, considerations, and limitations for the proper application of PowerFlex drives used in common bus configurations.
Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives Installation Instructions, publication DRIVES-IN001	Provides the basic information needed to properly wire and ground Pulse Width Modulated (PWM) AC drives.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley® distributor or Rockwell Automation® sales representative.

Comparison and Selection

Overview and Layout

1336 REGEN Line Regeneration Package

The 1336 REGEN Line Regeneration Package is a line regenerative option for drives in the 1336 drive family. Line regeneration refers to the removal of energy from the common DC bus of one or more AC drives, back onto the three-phase AC utility line.

The 1336 REGEN Line Regeneration Package operates in two basic modes: Regenerative DC Bus Supply, and Regenerative Braking. These two operating modes give the 1336 REGEN Line Regeneration Package the flexibility to handle a wide variety of applications.

1336 REGEN Line Regeneration Package Components

The 1336 REGEN Line Regeneration Package consists of two main pieces:

- A Converter that transforms a three-phase AC input source into a DC output source.
- A Precharge Unit that limits inrush current and provides AC line voltage phase and magnitude information to the converter.

In addition to these two components, a 1321 Line Reactor is required. The line reactor used for Regenerative Bus Supply applications is a custom design with a nominal impedance of 10%. Operation in the Regenerative DC Bus Supply Mode may also require the use of an additional power line filter, depending upon the AC line source impedance. Operation in the Regenerative Brake Mode requires the use of a line reactor with a nominal impedance of 3%. Figure 1 and Figure 2 show the basic layout differences between the1336 REGEN Regenerative DC Bus Supply, and the 1336 REGEN Regenerative Brake applications, respectively.

How to Choose a Mode of Operation

Several characteristics influence the choice of an operating mode for a given application. The 1336 REGEN Line Regeneration Package can be used with any 380...480 volt drive in the 1336 family. The desired performance of the combined AC drive/Line Regeneration Package dictates which mode of operation is best for an application. The choice of operating mode also affects the cost of implementation, since hardware requirements are different for the two modes of operation. The following discussion describes these two modes in detail and points you to the best operating mode for several common applications.

The Regenerative DC Bus Supply Mode

In the Regenerative DC Bus Supply Mode, the 1336 REGEN Line Regeneration Package supplies both motoring and regenerative current to one or more common bus drives.

IMPORTANT A common bus drive is not a standard AC-input AC drive. Throughout this manual a common bus drive is defined as a 1336 family AC drive designed to be powered by a DC power source connected to a common DC bus.

When the net power requirement of the attached common bus drives demand **motoring power**, energy flows from the utility to the common DC bus.

When the net power requirement of the attached common bus drives demand **regenerative power**, energy flows from the common DC bus to the utility.

- Precharge for all common bus drives on the common DC bus is accomplished through the 1336 REGEN Line Regeneration Package. As a result, three-phase AC power is not connected to the individual drives. However, individual common bus drives do have separate precharge circuits, to allow them to be connected to the powered DC bus.
- Since the 1336 REGEN Line Regeneration Package supplies both motoring and regenerative current to the drives, the precharge, converter, and line reactor must all be sized to handle the peak power requirements of the connected common bus drives in any quadrant of drive operation.
- In the Regenerative DC Bus Supply Mode, the 1336 REGEN Converter operates as a Pulse Width Modulation (PWM) converter, creating sinusoidal input AC line currents under both motoring and regenerating conditions. Operation in this mode results in the additional benefit of very low harmonic current distortion that typically meets Institute of Electrical and Electronics Engineers (IEEE) 519-1992 specifications.

IMPORTANT Refer to Chapter 2 of the 1336 REGEN Line Regeneration Package User Manual, publication 1336 REGEN-5.0, for 1336 REGEN Regenerative DC Bus Supply applications including Installation, Setup, and Programming information.

The Regenerative Brake Mode

In the Regenerative Brake Mode, the 1336 REGEN Line Regeneration Package removes energy from the DC bus of a standard 1336 AC drive back to the utility.

- When the connected AC drive is motoring, it receives energy directly from the three-phase AC line through its input terminals and Diode Bridge.
- When the connected AC drive is regenerating, energy flows from the DC bus back to the three-phase utility through the 1336 REGEN Line Regeneration Package.

Precharge of the DC bus is accomplished simultaneously through the 1336 REGEN Precharge Unit and the precharge circuit of the 1336 AC drive. In the Regenerative Brake Mode, the 1336 REGEN Line Regeneration Package is not required to supply motoring current to the AC drive. Because of this, the 1336 REGEN Line Regeneration Package can be sized to provide whatever braking capability is needed by the application, independent of the total horsepower (HP) needed for motoring.

In the Regenerative Brake Mode, the 1336 REGEN Line Regeneration Package switches synchronously with the AC line voltage, but does not attempt to create sinusoidal input AC line currents with a PWM scheme. The resulting power factor is near unity. The AC line current harmonic spectrum resulting from the combination of an AC drive and a 1336 REGEN Line Regeneration Package operating in the Regenerative Brake Mode is nearly equal to that of a standard 1336 AC drive that is motoring.

IMPORTANT Refer to Chapter 3 of the 1336 REGEN Line Regeneration Package User Manual, publication 1336 REGEN-5.0, for 1336 REGEN Regeneration Brake applications including Installation, Setup, and Programming information.

Which 1336 REGEN Operating Mode is For Your Application?

Application Requirements	REGEN DC Bus Supply Mode	REGEN Brake Mode
Low Current Harmonics	X	X
Multiple Drive Applications	X	X
High Power Factor	❶	X
Equal Braking and Motoring HP	❶	X
Less Braking than Motoring HP	❶	X
Single Drive Application	❶	X
Intermittent Braking or Low Braking Duty Cycle	❶	X

❶ The Regenerative Bus Supply Mode can also be used for these applications, but will result in a more complex hardware configuration and a higher total system cost. Regenerative Bus Supply operation requires a custom Bulletin 1321 10% line reactor, while Regenerative Brake operation requires a standard Bulletin 1321 3% line reactor. The mode of operation is selected by a parameter setting for parameter 1 [Operational Mode] in the 1336 REGEN Converter. Refer to the Programming sections in Chapters 2 and 3 of the 1336 REGEN Line Regeneration Package User Manual, publication 1336 REGEN-5.0.

1336 Regenerative DC Bus Supply Operation

Overview

When properly sized, the 1336 REGEN Line Regenerative Package represents an amp-rated package that can provide a DC bus to one or more common bus drives in the Regen DC Bus Supply mode.

General Precautions

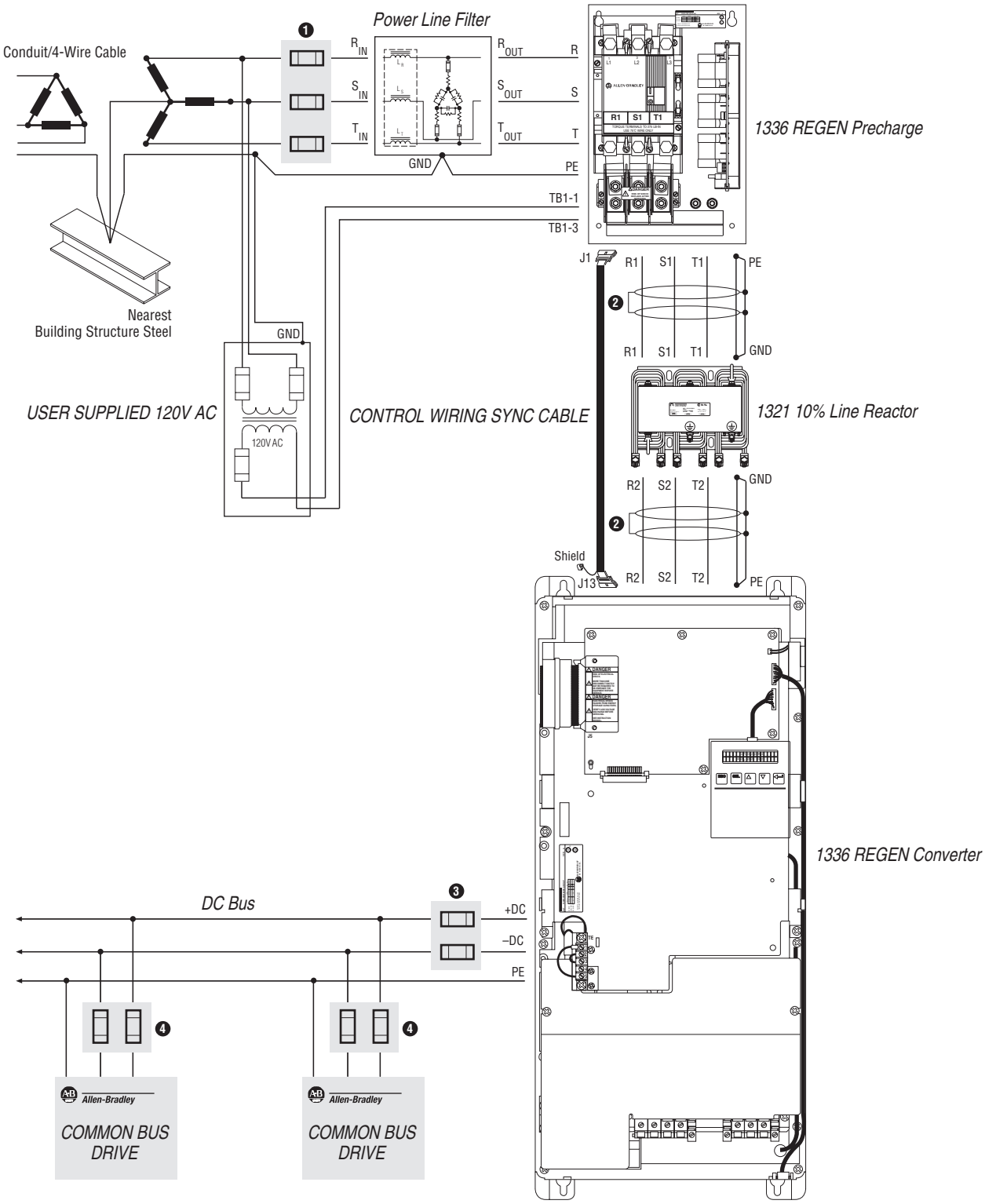
ATTENTION: Only personnel familiar with the 1336 REGEN Line Regeneration Package and associated equipment should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: Voltage distortion and possible component damage can result from the voltage divider effect between AC line source impedance and the 10% 1321 Line Reactor used with the 1336 REGEN Line Regeneration Package. An additional power line filter must be used to reduce AC line voltage distortion whenever source impedance is greater than 10% of the per phase impedance supplied by the 10% line reactor. If source impedance is unknown, the power line filter should be installed as a general precaution.

ATTENTION: This product and its associated equipment contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference publication 8000-4.5.2 "Guarding Against Electrostatic Damage" or any other applicable ESD protection handbook.

ATTENTION: The 1336 REGEN Line Regeneration Package is shipped from the factory with Parameter 1 [Operational Mode] set to the Regenerative Brake Mode of operation. For Regenerative DC Bus Supply applications, this parameter must be set to the Regenerative DC Bus Supply Mode as described in the Programming section of this chapter. Incorrectly applied or installed equipment can result in component damage or a reduction in product life. Wiring or application errors, such as incorrect or inadequate AC supply or excessive ambient temperatures may result in malfunction of the Line Regenerative Package.

Figure 1 - 1336 Regenerative DC Bus Supply Layout



❶ Refer to **Input AC Line Fusing**, Table 13 on page 28.
❷ Optional shielded cable. Install as needed.
❸ Refer to **Output DC Bus Fusing**, Table 13 on page 28.
❹ Consult Rockwell Automation Application Engineering for common bus AC drive fuse specifications.

1336 Regenerative Brake Operation

Overview

The 1336 REGEN Line Regeneration Package represents an amp-rated package that can remove energy from the DC bus of a 1336 PLUS™, 1336 PLUS™ II, 1336 FORCE™, or 1336 IMPACT™ AC drive and send it back to the utility. When properly sized with one or more standard 1336 PLUS, PLUS II, FORCE, or IMPACT AC drives, Regenerative Brake Operation provides an energy efficient alternative solution to dynamic braking.

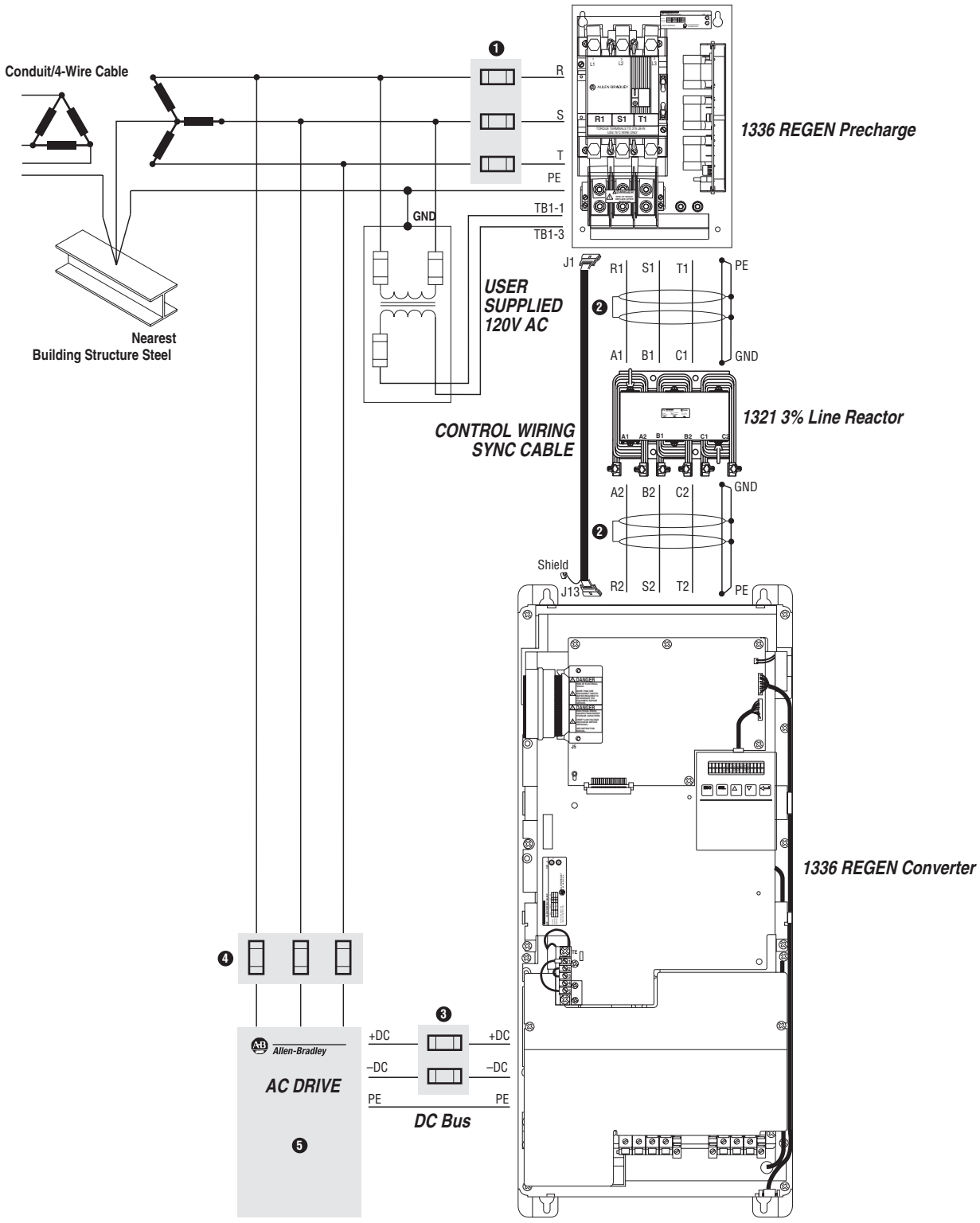
General Precautions

ATTENTION: Only personnel familiar with the 1336 REGEN Line Regeneration Package and associated equipment should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: This product and its associated equipment contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference publication 8000-4.5.2 "Guarding Against Electrostatic Damage" or any other applicable ESD protection handbook.

ATTENTION: The 1336 REGEN Line Regeneration Package is shipped from the factory with Parameter 1 set to the Regenerative Brake Mode of operation. Ensure that Parameter 1 [Operational Mode] is set to its factory setting of Regenerative Brake Mode as described in the Programming section of this chapter. Incorrectly applied or installed equipment can result in component damage or a reduction in product life. Wiring or application errors, such as incorrect or inadequate AC supply or excessive ambient temperatures may result in malfunction of the 1336 REGEN Line Regeneration Package.

Figure 2 - 1336 Regenerative Brake Layout

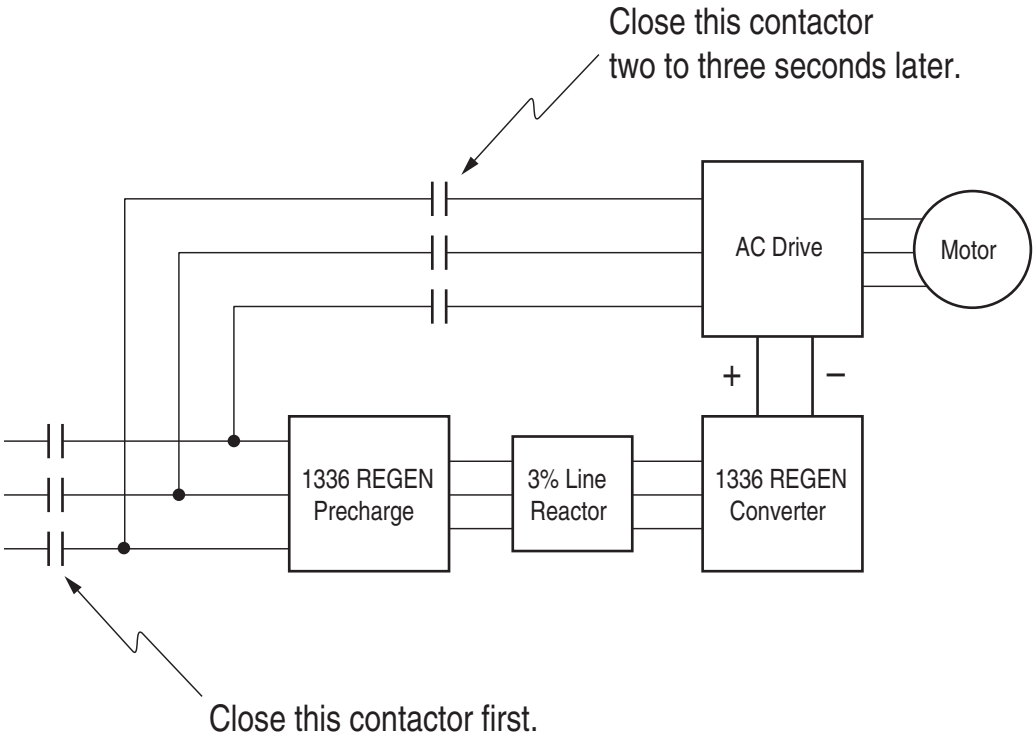


❶ Refer to **Input AC Line Fusing**, Table 13 on page 28.
❷ Optional shielded cable. Install as needed.
❸ Refer to **Output DC Bus Fusing**, Table 13 on page 28.
❹ Refer to the AC Line Input Fuses recommended in Table 13 on page 28.
❺ Important: If you are using a Regenerative Brake with a B Frame AC drive, refer to Power-up Sequence for Regenerative Brakes and AC Drives on page 12

Power-up Sequence for Regenerative Brakes and AC Drives

When using a 1336 REGEN Line Regeneration Package, a power-up sequence is needed to avoid clearing the AC line fuses on the input of the AC drive or the DC bus fuses between the drive and the Regenerative Brake. These fuses will clear if both the 1336 REGEN Package and the AC drive are powered up from the AC supply simultaneously. To avoid the problem, the Regenerative Brake should be powered up before the AC Drive is connected to the AC line. The 1336 REGEN Precharge circuit will charge the capacitor bank in both the 1336 REGEN Converter and in the connected AC drive. The AC line can then safely be connected to the AC drive.

Figure 3 - 1336 REGEN Power-up Sequence



Note: Refer to Chapter 11 of the PowerFlex AC Drives in Common Bus Configurations Application Guidelines, publication DRIVES-AT002, for more details.

8720MC-RPS Regenerative Power Supply

Overview

The 8720MC-RPS Regenerative Power Supply Bidirectional Converter is a sinusoidal PWM converter which can control increase of DC bus voltage and perform continuous power generation.

The 8720MC-RPS Regenerative Power Supply, therefore, can be used as power supply unit for various drives and inverter units.

The following units are UL/C-UL listed:

- 8720MC-RPS065BM and 8720MC-RPS065BS
- 8720MC-RPS190BM and 8720MC-RPS190BS

Also, the Declaration of Conformity with the requirement for CE Mark has been issued for all the units.

- 8720MC-RPS065Bx – http://www.rockwellautomation.com/products/certification/ce/pdf/DST-0001-G-EN.pdf
- 8720MC-RPS190Bx – http://www.rockwellautomation.com/products/certification/ce/pdf/DST-0604-C-EN.pdf

The 8720MC-RPS Regenerative Power Supply is a bidirectional converter with the following features:

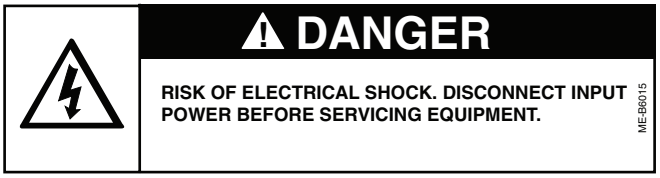
- Use of chopper-type voltage increasing method with sinusoidal pulse-width-modulated (PWM) waveform control.
- Programmable DC bus voltage.
- Continuous power regeneration.
- Attenuation of the higher order harmonics in the line current.
- Safety interlocks and protection.

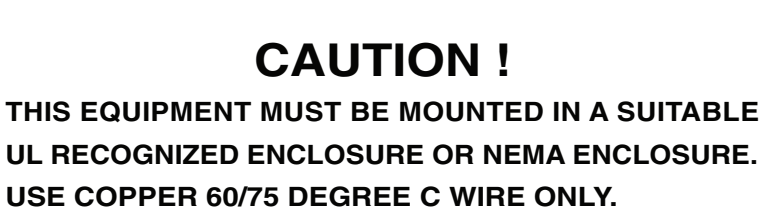
For more details and a complete understanding of the 8720MC-RPS Regenerative Power Supply installation, wiring, operation, and adjustment of the unit, please refer to the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001.

Notes on Handling the 8720MC-RPS Regenerative Power Supply

The following three labels are put on the 8720MC-RPS Regenerative Power Supply, advising you of the notes on handling the unit. Read and understand the contents before using the unit.

Figure 4 - 8720 Handling Danger and Caution Labels





8720MC-RPS Layout

ATTENTION: For operation of the 8720MC-RPS Regenerative Power Supply, a line reactor is **required** for each incoming phase as well as a varistor, a harmonic filter, and a contactor.

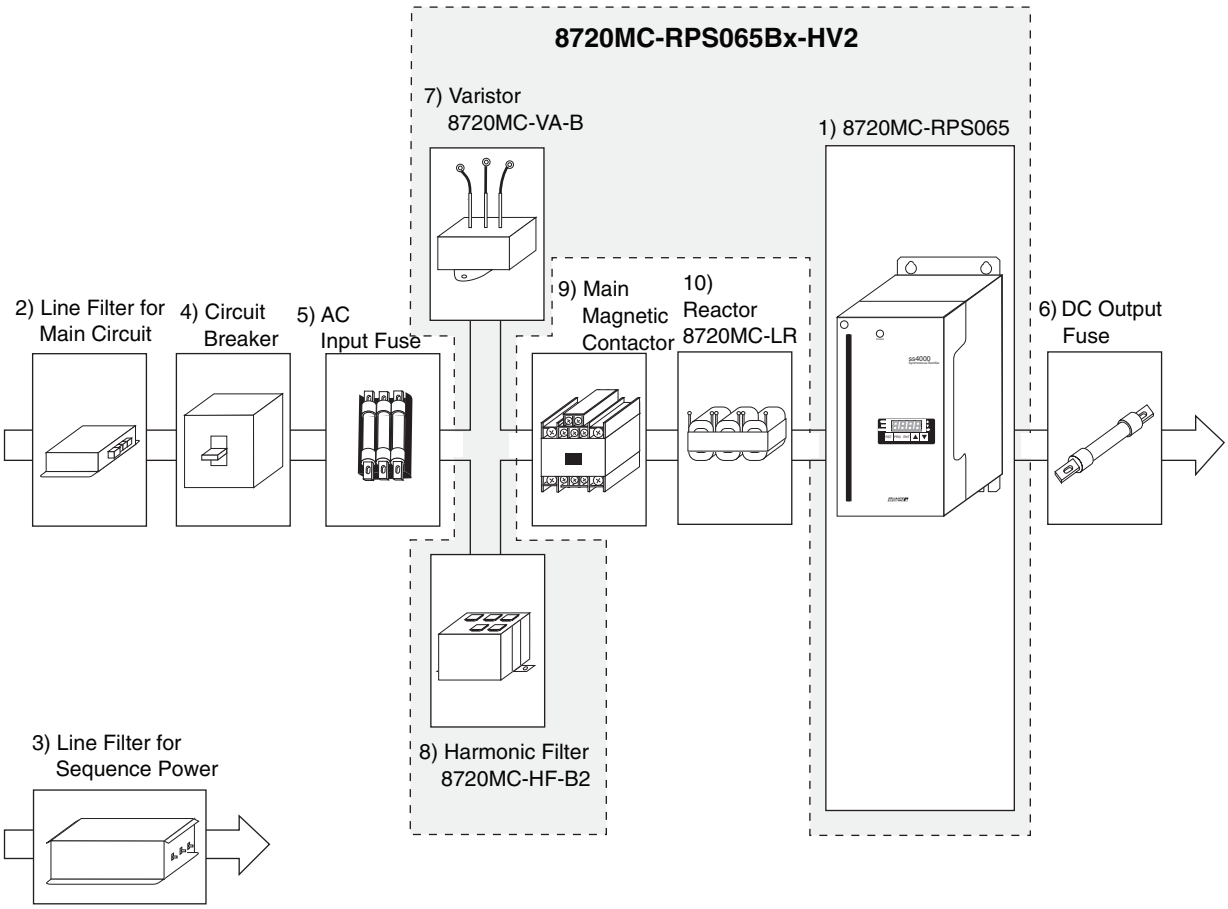
The system configuration of 8720MC-RPS065 (Figure 5) is composed of the following components.

1) 8720MC-RPS065	6) DC output fuse
2) Line filter for main circuit (1)	7) Varistor
3) Line filter for power that supplies the main magnetic contactor power (1)	8) Harmonic filter
4) Circuit breaker (2)	9) Main magnetic contactor
5) AC input fuse (2)	10) Line Reactor 8720MC-LR

(1) Not necessary when compliance with CE mark is not required.

(2) Circuit breakers with aux contacts are used when more than one RPS065Bx is used for interlocking purposes. See 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001 for more details. A circuit breaker OR AC Input fuses may be used based on required local code where the application is installed.

Figure 5 - 8720MC-RPS065 System Configuration



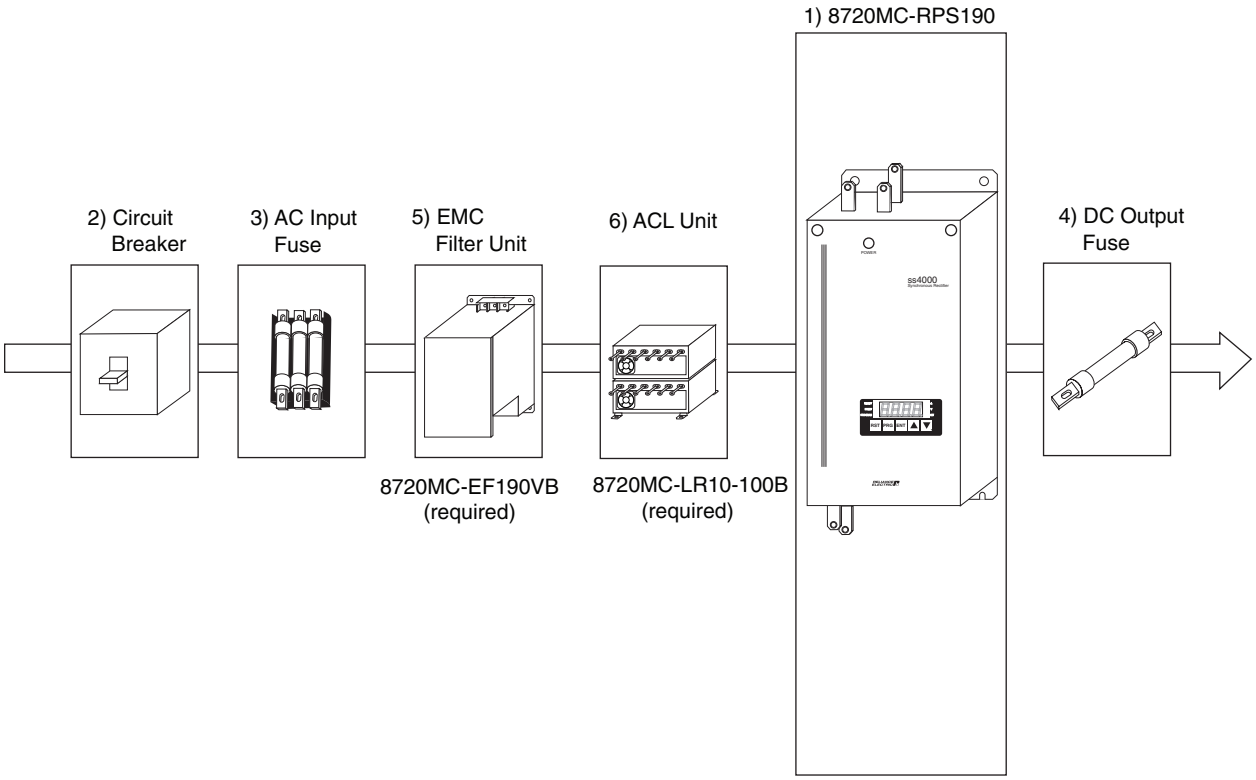
The system configuration of 8720MC-RPS190 (Figure 6) is composed of the following components.

1) 8720MC-RPS190	4) DC output fuse
2) Circuit breaker (1)	5) EMC filter unit (8720MC-EF190VB, required)
3) AC input fuse (1)	6) ACL unit (8720MC-LR10-100B, required)

(1) Circuit breakers with aux contacts are used when more than one RPS065Bx is used for interlocking purposes. See 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001 for more details. A circuit breaker OR AC Input fuses may be used based on required local code where the application is installed.

IMPORTANT The EMC filter unit (8720MC-EF190VB) and the ACL unit (8720MC-LR10-100B) are required for the 8720MC-RPS190 system configuration. Substitutions are not supported.

Figure 6 - 8720MC-RPS190 System Configuration



1336 REGEN to 8720MC-RPS Component Comparison

1336 REGEN Line Regeneration Package

- The combination of the 1336 REGEN Precharge and Converter units is equivalent to the 8720MC-RPS unit.
- The 1321 Line Reactors used within the 1336 REGEN package is equivalent to the 8720MC-LR units.
  - **Note:** The 1321 line reactor can be used in front of an AC drive for DC bus circulating currents when in a power regeneration mode only.
- The 1336 REGEN Power Line Filter functionality is equivalent to the 8720MC-RPS EMC Filter unit functionality which is comprised of the 8720MC-RPS Varistor, Harmonic Filter, and Main Magnetic contactor units.
- The user-supplied 120VAC transformer for the 1336 REGEN Precharge and Converter units can be used for the 8720MC-RPS main magnetic contactor control terminals.

IMPORTANT When migrating from the 1336 REGEN system to an 8720MC-RPS system you must replace the 1336 REGEN system components with the respective 8720MC-RPS system components stated above and depicted below in Figure 7, Figure 8, Figure 9, and Figure 11. **The color-shaded areas indicate similar components across the different systems.**

Figure 7 - 1336 REGEN Regenerative DC Bus Supply System Components

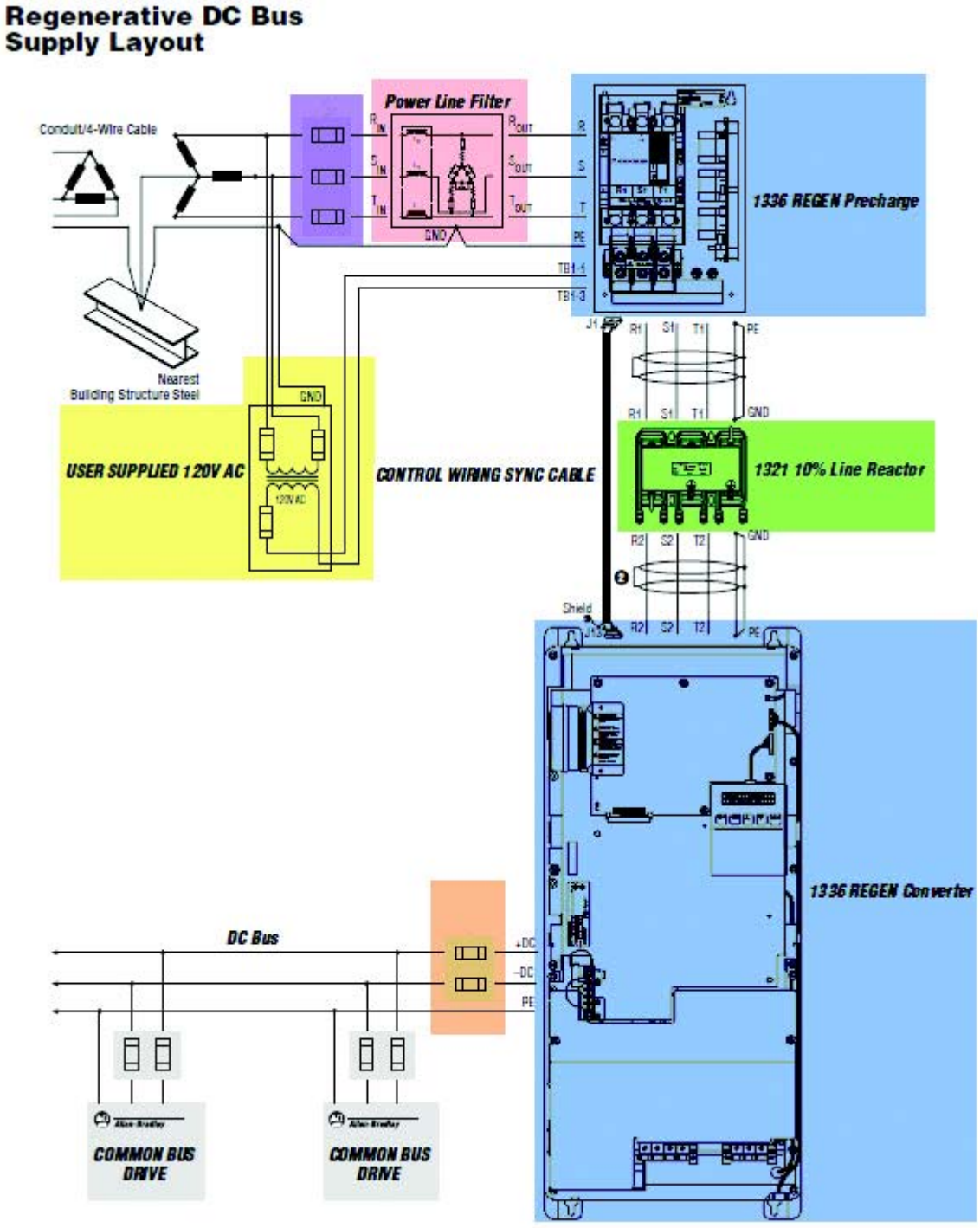
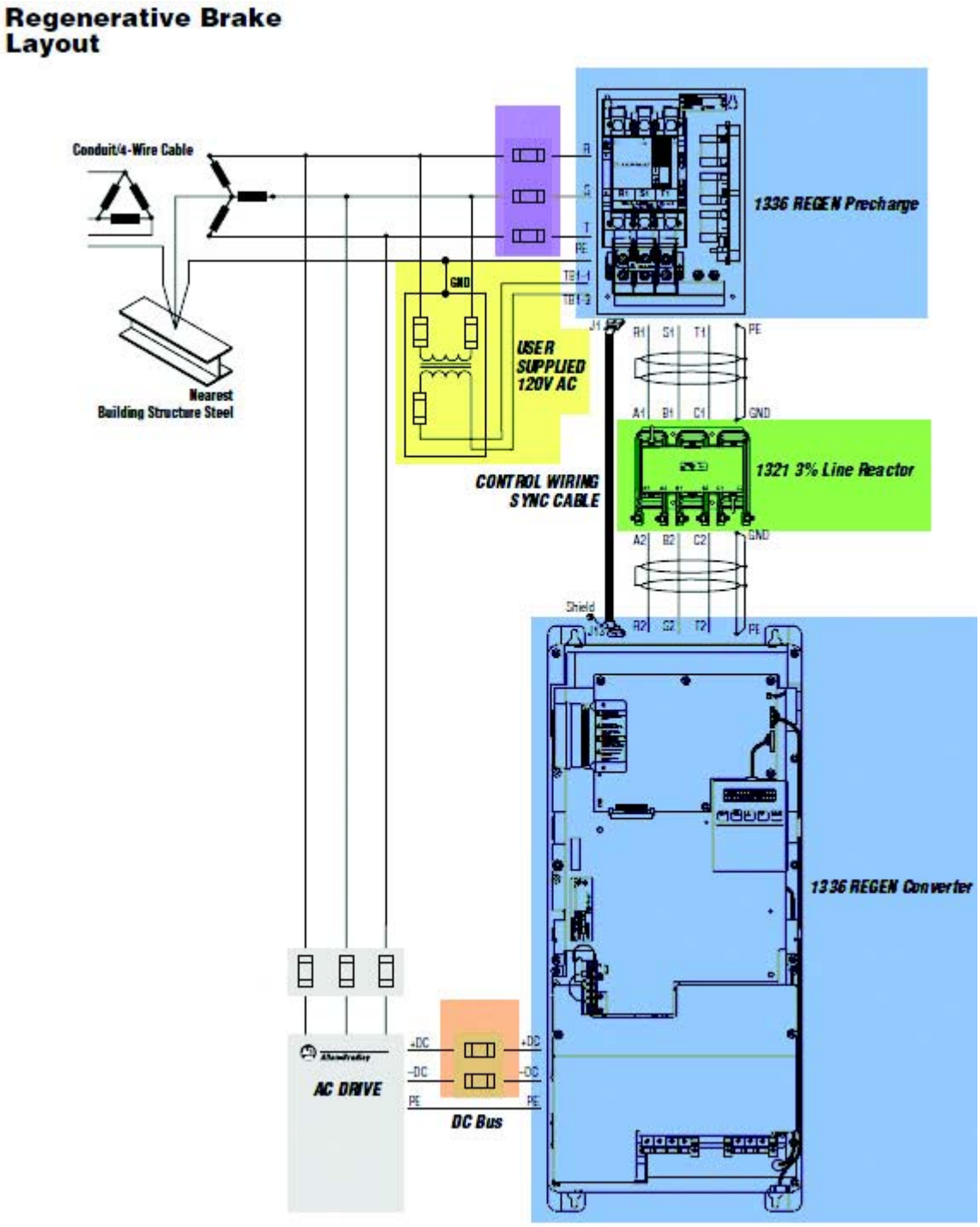


Figure 8 - 1336 REGEN Regenerative Brake System Components



8720MC-RPS Regenerative Power Supply Package

Figure 9 - 8720MC-RPS065 System Components

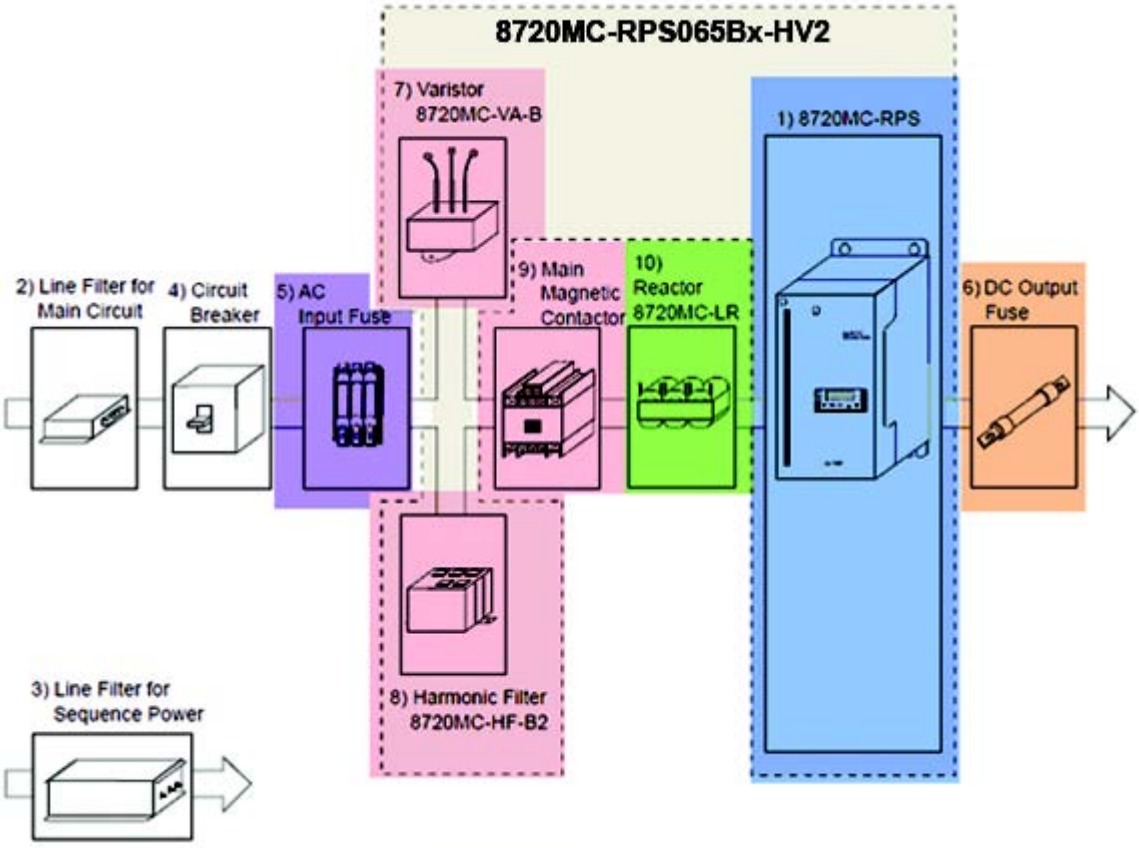


Figure 10 - 8720MC-RPS190 System Components

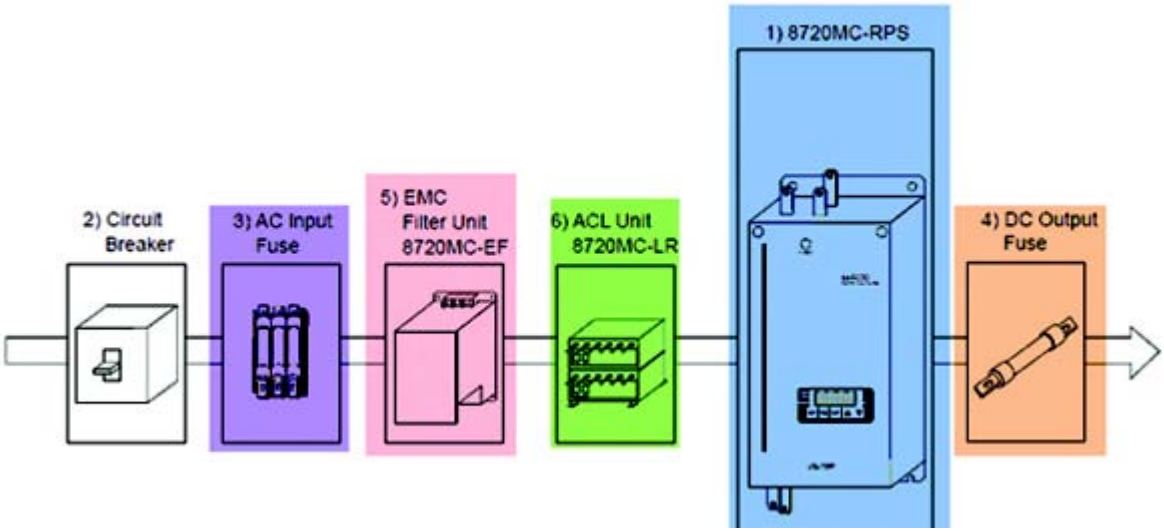
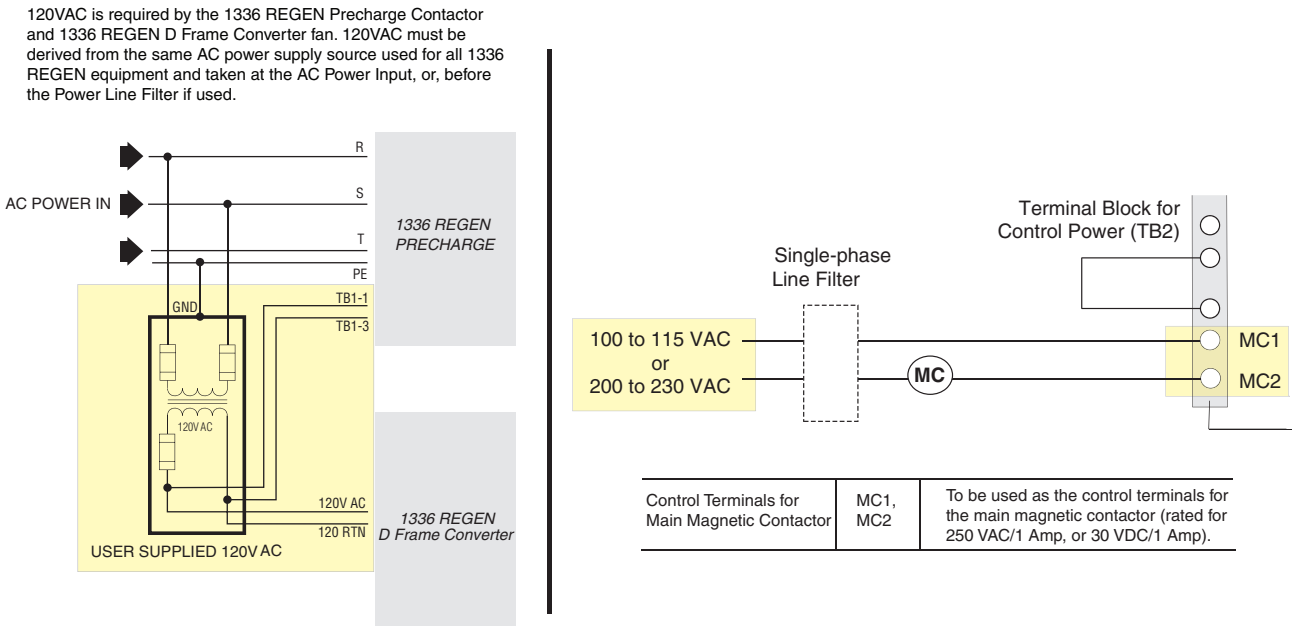


Figure 11 - 1336 REGEN to 8720MC-RPS065 User Supplied AC Input Power



IMPORTANT Figure 11 is applicable only to the 8720MC-RPS065 unit. The 8720MC-RPS190 unit uses the 8720MC-EF190VB EMC filter to supply voltage to MC1 and MC2.

Specifications

1336 REGEN Line Regeneration Package

Table 1 - 1336 REGEN Technical Specifications

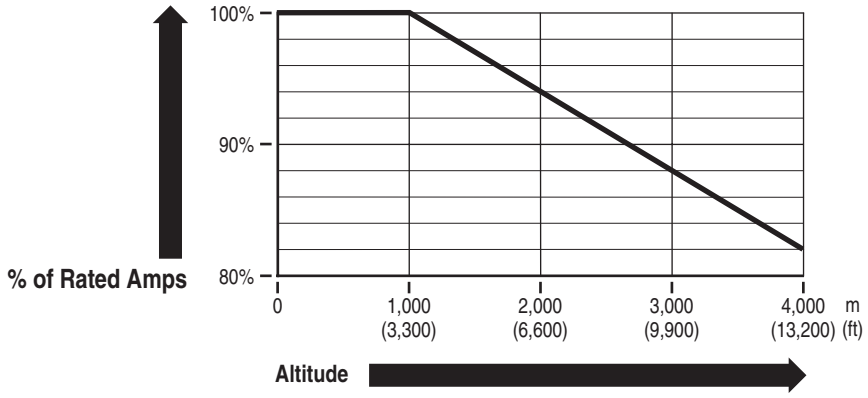
Electrical	AC Main Supply and Auxiliary Voltage	380...480VAC, 3Ø, +10%/–15% Nominal 48...62Hz 90...115VAC, 1Ø, ±10% Nominal 48...62Hz
Environmental	Ambient Operating Temperature	IP00 (Open) 0...50°C (32...122°F) IP20 (NEMA Type 1) 0...40°C (32...104°F)
	Storage Temperature	All Ratings -40...85°C (-40...185°F)
	Relative Humidity	5...95% Non-condensing
	Shock	15g Peak for 11mSec. Duration (±1.0mSec.)
	Vibration	0.152 mm (0.0006 in.) Displacement, 1g Peak
	ESD Susceptibility: IP20 (NEMA Type 1) Only	15kV
	Agency Certification: U.L. Listed CSA Certified	

Protection	**Regenerative DC Bus Supply Mode Only**		
		380VAC Input	**480VAC Input**
	Bus Overvoltage Trip	670VDC	850VDC
	Bus Undervoltage Trip	430VDC	520VDC
	Nominal Bus Voltage	610VDC	735VDC
	AC Input Overvoltage Trip	Factory Set to +15% of Nominal Line Voltage	
	Heatsink Over Temperature Trip	100°C (212°F)	
	Converter Overcurrent Trip: Software Overcurrent Limit Hardware Overcurrent Limit	 Factory Set to 192% of AC Input Current Factory Set to 245% of AC Input Current	
	Line Transients	Up to 6000 Volts Peak per ANSI C62.41-1991	
	Control Logic Noise Immunity	Showering Arc Transients Up to 1500 Volts Peak	
	Power Ride-Thru	6 mSec. at Full Load	
	Control Logic Ride-Thru	0.5 Sec. Minimum, 2 Sec. Typical	

Table 2 - 1336 REGEN Heat Dissipation

Regenerative DC Bus Supply Operation Only — 380...480VAC Input						
Package Amp Rating	**Converter**	**Converter Heatsink**	**Precharge Unit**	**10% Line Reactor**	**Power Line Filter**	**Package Total**
48A	141W	820W	15W	186W	173W	1335W
78A	193W	1110W	29W	258W	236W	1826W
180A	522W	2664W	58W	474W	317W	4035W
Regenerative Brake Operation Only — 380...480VAC Input						
Package Amp Rating	**Converter**	**Converter Heatsink**	**Precharge Unit**	**3% Line Reactor**	—	**Package Total**
48A	141W	656W	15W	65W		877W
78A	193W	888W	29W	84W		1194W
180A	522W	2131W	58W	168W		2879W

Figure 12 - 1336 REGEN Altitude Derating



8720MC-RPS Regenerative Power Supply

Table 3 - 8720MC-RPS Technical Specifications

Voltage Class			**15 kW Unit**	**37 kW Unit**			**125 kW Unit**		
Number of Units Connected in Parallel			Single Unit	Single Unit	2 Units in Parallel	3 Units in Parallel	Single Unit	2 Units in Parallel	3 Units in Parallel
Model Number			8720MC-RPS027BM	8720MC-RPS065BM	RPS065BM RPS065BS	RPS065BM RPS065BS RPS065BS	8720MC-RPS190BM	RPS190BM RPS190BS	RPS190BM RPS190BS RPS190BS
Capacity of Motor to be Applied (kW)			The 15 kW unit is no	37	75	110	125	250	375
Input	**Rated Capacity of Power Supply (kVA)**		longer availabe.	45	90	135	152	304	457
	Input Power Factor		0.95 or higher						
	Power Supply		380 to 460 VAC +10/-15%, 50/60 Hz +/- 5%						
	Rated Current (Arms)			65	130	195	190	380	570
	Maximum Current (1 min.) (Arms)			98	196	294	285	570	855
	PWM Carrier Frequency (kHz)		5, 10 (standard), and 15				5 (standard), 10 and 15		
Output	**Rated Output Capacity (kVA)**			45	90	135	133	266	399
	Voltage (V)		750 (standard)						
	Rated Current (A)			64	128	192	190	380	570
	Maximum Current (1 min.) (A)			96	192	288	285	570	855
	Bus Capacitance (µF)			1900	1900 x 2	1900 x 3	7600	7600 x 2	7600 x 3
Protection Functions			Overcurrent, overload, overvoltage, low voltage, and phase loss						
Output Signals			RDY signal, FR signal, instantaneous power loss signal, and main magnetic contactor reference contact						
Monitor Display (WITH four character seven-segment LED)			Input current, input power supply voltage, DC bus voltage, power and load ratio						
Input Signals			RUN signal, RESET signal, and answer-back signal of main magnetic contactor						
Environment	**Place of Installation**		In a control cabinet (kept away from corrosive and dangerous gas)						
	Ambient Temp.	(In use)	-10 to 50 degree C (14 to 122 degree F)				-10 to 40 degree C (14 to 104 degree F),		
		(Stored)	-40 to 65 degree C (-40 to 149 degree F)				-40 to 65 degree C (-40 to 149 degree F)		
	Heat Dissipation (kW)			1.1	1.1 x 2	1.1 x 3	4.0	4.0 x 2	4.0 x 3
	Ambient Humidity		5 to 95% (non-condensation)						
	Elevation		Lower than 1,000 meters (3,300 feet) above sea level						
	Vibration		Less than 1 G (25 Hz)						
	Shock		Less than 2 G						
Weight (kg (lbs))				13.5 (29.7)	13.5 x 2 (29.7 x 2)	13.5 x 3 (29.7 x 3)	48.5 (108)	48.5 x 2 (108 x 2)	48.5 x 3 (108 x 3)

IMPORTANT The 15kW (27 Amp, 8720MC-RPS027BM) Unit is no longer available.

Catalog Number Explanation

Table 4 through Table 10 describe the 1336 REGEN Line Regeneration Package catalog numbering scheme.

1336 REGEN Line Regeneration Package

The Line Regeneration Package includes both the 1336 REGEN Precharge and 1336 REGEN Converter. The appropriate line reactor, either 3% or 10%, is ordered separately.

Table 4 - 1336 REGEN Catalog Number Explanation

1336R	VB	180	AA	mods
First Position **Bulletin Number**	Second Position **Voltage**	Third Position **Nominal Current Rating**	Fourth Position **Enclosure Type**	Fifth Position **Human Interface Module, IP 20 (NEMA Type 1)**
	Letter Voltages	Code kW (Amps)	Code Type	Code Description
	VB 380-480V AC 3Ø 50/60 Hz	048 38.4 (48.2) 078 62.3 (78.2) 180 143.7 (180.4)	AA NEMA 1 (IP 20) AN Open (IP 00)	HAB Blank — No Functionality HAP Programmer Only

Table 5 - 1336 REGEN Line Regeneration Package - Includes Converter (CNV) and Precharge (PRE)

	Nominal Brake Rating		IP 00 (Open) No Enclosure	IP 20 (NEMA Type 1) General Purpose
Frame	**Input Amps**	**Output kW**	**Code**	**Code**
B	48.2	38.4	VB048-AN	VB048-AA
C	78.2	62.3	VB078-AN	VB078-AA
D	180.4	143.7	VB180-AN	VB180-AA

1336 REGEN Converter

The 1336 REGEN Converter unit can be ordered separately.

Table 6 - *1336 REGEN Converter*

1336R	-VB			180CNV					-AN		-mods	
Cat. No.	Voltage			Rating					Enclosure Type		HIM Type	
1336R	Letter	AC Input Volts	DC Output Volts	Code	AC Input kVA	AC Input Amps	DC Output Amps	DC Output kVA	Code	Type	Code	Description
	-VB	380-480V AC 3Ø 50/60Hz	735V DC	**048**	32-40	48.2	52	38	**-AA**	IP 20 (NEMA Type 1)	**-HAB**	Blank — No Functionality
				078	51-65	78.2	85	62	**-AN**	IP 00 (Open)	**-HAP**	Programmer Only
				180	119-150	180.4	196	144				

1336 REGEN Precharge Unit

The 1336 REGEN Precharge unit can be ordered separately.

Table 7 - 1336 REGEN Precharge Unit

1336R	-VB			048PRE					-AN	
Cat. No.	Voltage			Rating					Enclosure Type	
1336R	Letter	AC Input Volts	AC Output Volts	Code	AC Input kVA	AC Input Amps	AC Output kVA	AC Output Amps	Code	Type
	-VB	380-480V AC 3Ø 50/60Hz	380-480V AC 3Ø 50/60Hz	**048**	32-40	48.2	32-40	48.2	**-AA**	IP 20 (NEMA Type 1)
				078	51-65	78.2	51-65	78.2	**-AN**	IP 00 (Open)
				180	119-150	180.4	119-150	180.4		

1321 Line Reactor — 380...480VAC

Table 8 - 1321 3% Line Reactors

1321	-3RA		200			B	
Catalog Number	Enclosure Type		Rating			Voltage	
1321	Code	Type	Code	AC I/O Amps	Per Phase Inductance	Letter	AC Input/Output Volts
	-3R	IP 00 (Open)	**55**	48	0.50mH	**B**	380-480V AC 3Ø 50/60Hz
	-3RA	IP 20 (NEMA Type 1)	**100**	78	0.30mH		
			200	180	0.110mH		

Table 9 - 1321 10% Line Reactors

1321	-3LRA		180			-B	
Catalog Number	Enclosure Type		Rating			Voltage	
1321	Code	Type	Code	AC I/O Amps	Per Phase Inductance	Letter	AC Input/Output Volts
	LR	IP 00 (Open)	**048**	48	1.6mH	**-B**	380-480V AC 3Ø 50/60Hz
	LRA	IP 20 (NEMA Type 1)	**078**	78	1.0mH		
			180	180	0.430mH		

1321 EMI Filters — 380…480V AC

Table 10 - 1321 EMI Filters - 380 … 480V AC

Nominal Rating	IP00 Open Style	IP20 (NEMA Type 1)
Amps	Cat. No.	Cat. No.
48	1321-VB048FLT-AN	1321-VB048FLT-AA
78	1321-VB078FLT-AN	1321-VB078FLT-AA
180	1321-VB180FLT-AN	1321-VB180FLT-AA

Power Line Filter

The 1336 Regenerative DC Bus Supply Layout has a Power Line Filter which is comprised of a 1321 3% Line reactor and 1321 Electromagnetic Interference (EMI) Filter that are ordered separately.

1336 REGEN Precharge-to-Converter Sync Cable

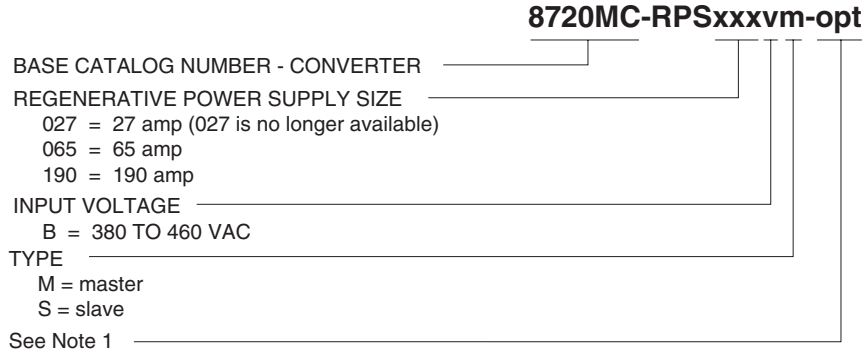
This Precharge-to-Converter Sync cable connects the precharge board of the precharge unit with the control board of the converter unit. The Sync cables come in two lengths, two and four meters.

- 1336R-CBL-SP1A = 2 m (6.5 ft)
- 1336R-CBL-SP2A = 4 m (13 ft)

8720MC-RPS Regenerative Power Supply

For operation of the 8720MC-RPS Regenerative Power Supply, a line reactor is required for each incoming phase as well as a varistor, a harmonic filter, and a contactor. Figure 13 through Figure 17 and Table 11 show the model numbers of the 8720MC-RPS Regenerative Power Supply and its accessories.

Figure 13 - 8720MC-RPS Regenerative Power Supply Catalog Number Explanation



Note 1: Blank includes the 8720MC-RPS only as a spare part. The HV2 option includes the 8720MC-RPS as well as 8720MC-HF-B2 harmonic filter and 8720MC-VA-B varistor. The HV2 option, however, is applied only to the 8720MC-RPS065.

IMPORTANT The 15kW (27 Amp, 8720MC-RPS027BM) Unit is no longer available.

Figure 14 - 8720MC-RPS Line Reactor Catalog Number Explanation

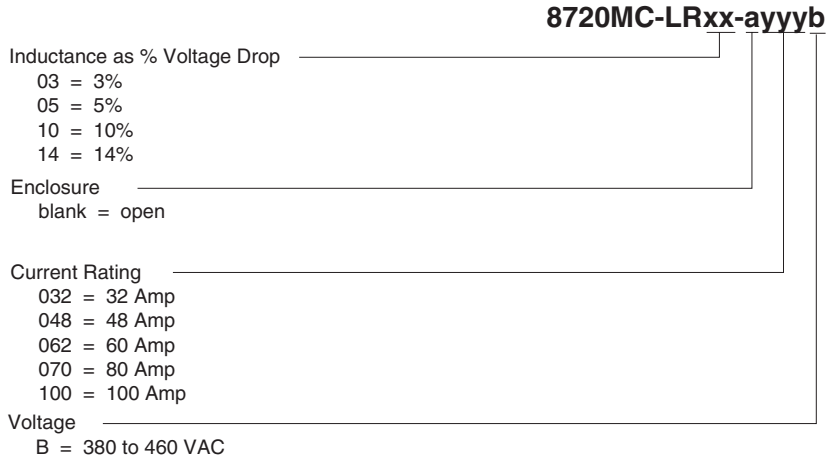


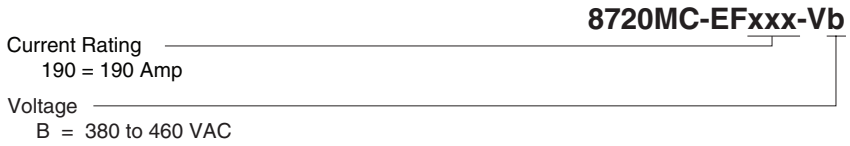
Table 11 - 8720MC-RPS Line Reactor Specifications

8720MC-RPS Line Reactors: 8720MC-	Specifications	
	Maximum Continuous Current: Amps	Inductance: uH
LR03-032B	32	850
LR05-048B	48	800
LR10-062B	62	1100
LR14-070B	70	1200
LR10-100B	100	800

Figure 15 - Harmonic Filter

Figure 16 - Varistor

Figure 17 - EMC Filter Unit



1336 REGEN to 8720MC-RPS Conversion Guide

Power Rating

Rockwell Automation suggests you compare the Power Rating (kW) when replacing 1336 REGEN Precharge/Converter units with 8720MC-RPS units.

Table 12 - 1336 REGEN to 8720MC-RPS Power Rating Comparison

1336R-VBXXX		
Rating Code	Output Power Rating	Frame Reference
48	38.4 kW	B
078	62.3 kW	C
180	143.7 kW	D
8720MC-RPSXXX		
Model Number	Power Rating	Connection
065BM x 1	37 kW	Single Unit
065BM + 065BS X 1	75 kW	Two Paralleled Units
065BM + 065BS X 2	110 kW	Three Paralleled Units
190BM x 1	125 kW	Single Unit
190BM + 190BS X 1	250 kW	Two Paralleled Units
190BM + 190BS X 2	375 kW	Three Paralleled Units

Fuses and Circuit Breakers

Table 13 - Fuses

Catalog Number	Input AC Line Fusing	Output DC Bus Fusing
1336R-VB048	70 Amps (1)	100 Amps (1)
1336R-VB078	125 Amps (1)	150 Amps (1)
1336R-VB180	250 Amps (1)	350 Amps (1)
8720MC-RPS065	100 Amps (2)	100 Amps (4)
8720MC-RPS190	350 Amps (3)	350 Amps (5)

(1) Gould Shamut A70QS.
(2) Gould A4J or equivalent Class J Fuse.
(3) Ferraz Shawmut or equivalent Class J Fuse.
(4) Ferraz Shawmut A130URD70LI0100.
(5) Ferraz Shawmut A130URD71LLI0350.

Table 14 - Circuit Breakers

Catalog Number	Rating	Recommended
8720MC-RPS065	100 Amps	Fuji Electric: SA100BA/100WD BU3ESB-50 W (UL-listed) (1)
		Westinghouse®: FDB3100 (1) or equivalent
8720MC-RPS190	350 Amps	Fuji Electric: BU-KSB3350LW (1)
		Westinghouse: KDB3350 (1) or equivalent

(1) Because supplemental contact of this circuit breaker does not conform with load of 5mA, relay with less than 5mA should be used for connection when a supplemental contact is connected with sequence input PWR.

Dimensions

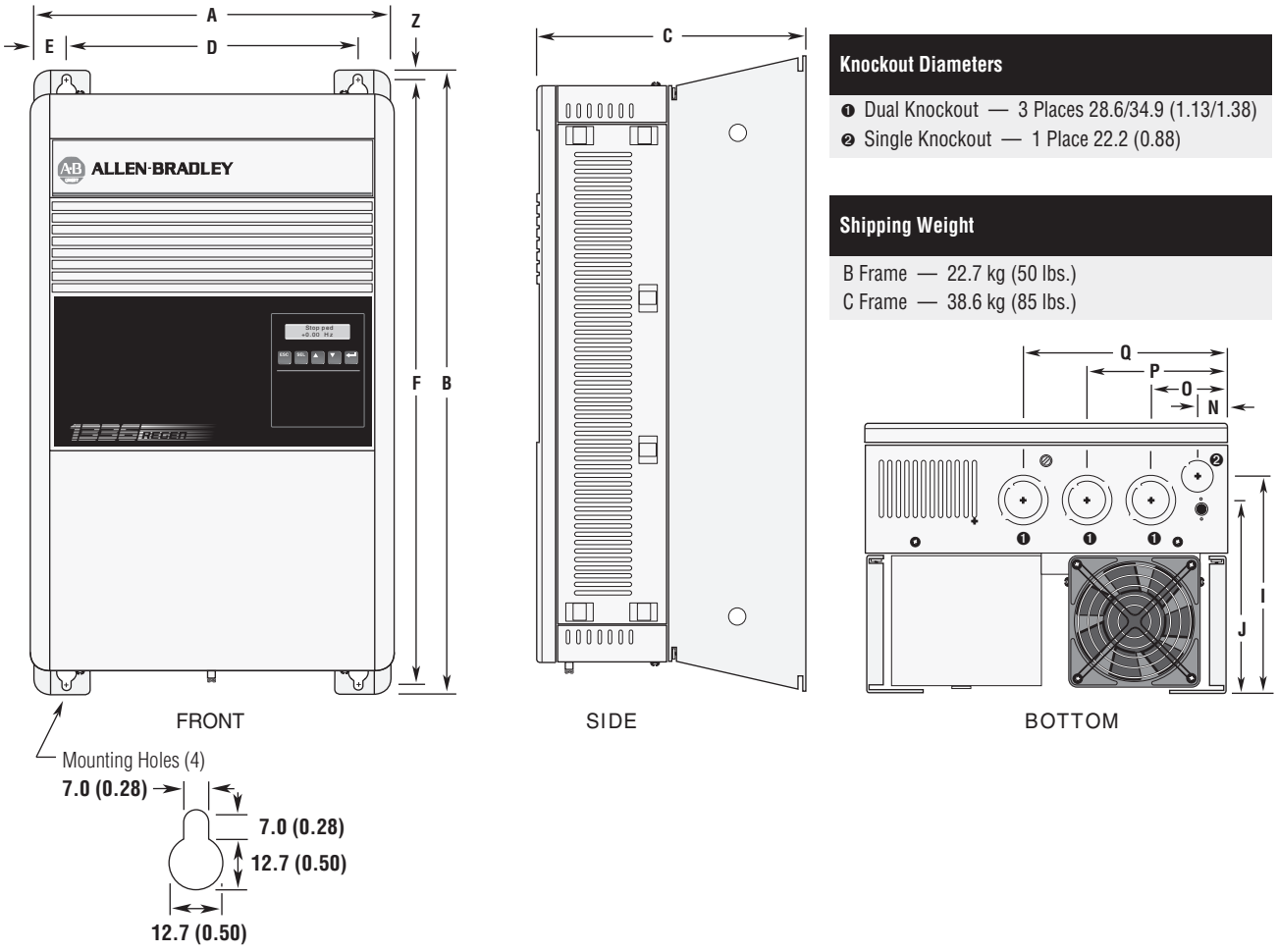
1336 REGEN Line Regeneration Package

This section provides detailed dimension information for the 1336 REGEN Line Regeneration Package. Included are:

- 1336 REGEN Converter Dimensions and Weights.
- 1336 REGEN Precharge Unit Dimensions and Weights.
- 1321 3% Line Reactor Dimensions and Weights for Regenerative Brake Operation.
- 1321 10% Line Reactor Dimensions and Weights for Regenerative DC Bus Supply Operation.
- 1321 Power Line Filter.
- 1336 REGEN Converter Heat Sink-Through-the-Back Cutout Dimensions.

Figure 18 - 1336 REGEN B and C Frame Converter

IMPORTANT Allow 152.4 mm (6.0 in.) on all sides for proper heat dissipation.



Knockout Diameters

❶ Dual Knockout — 3 Places 28.6/34.9 (1.13/1.38)
❷ Single Knockout — 1 Place 22.2 (0.88)

Shipping Weight

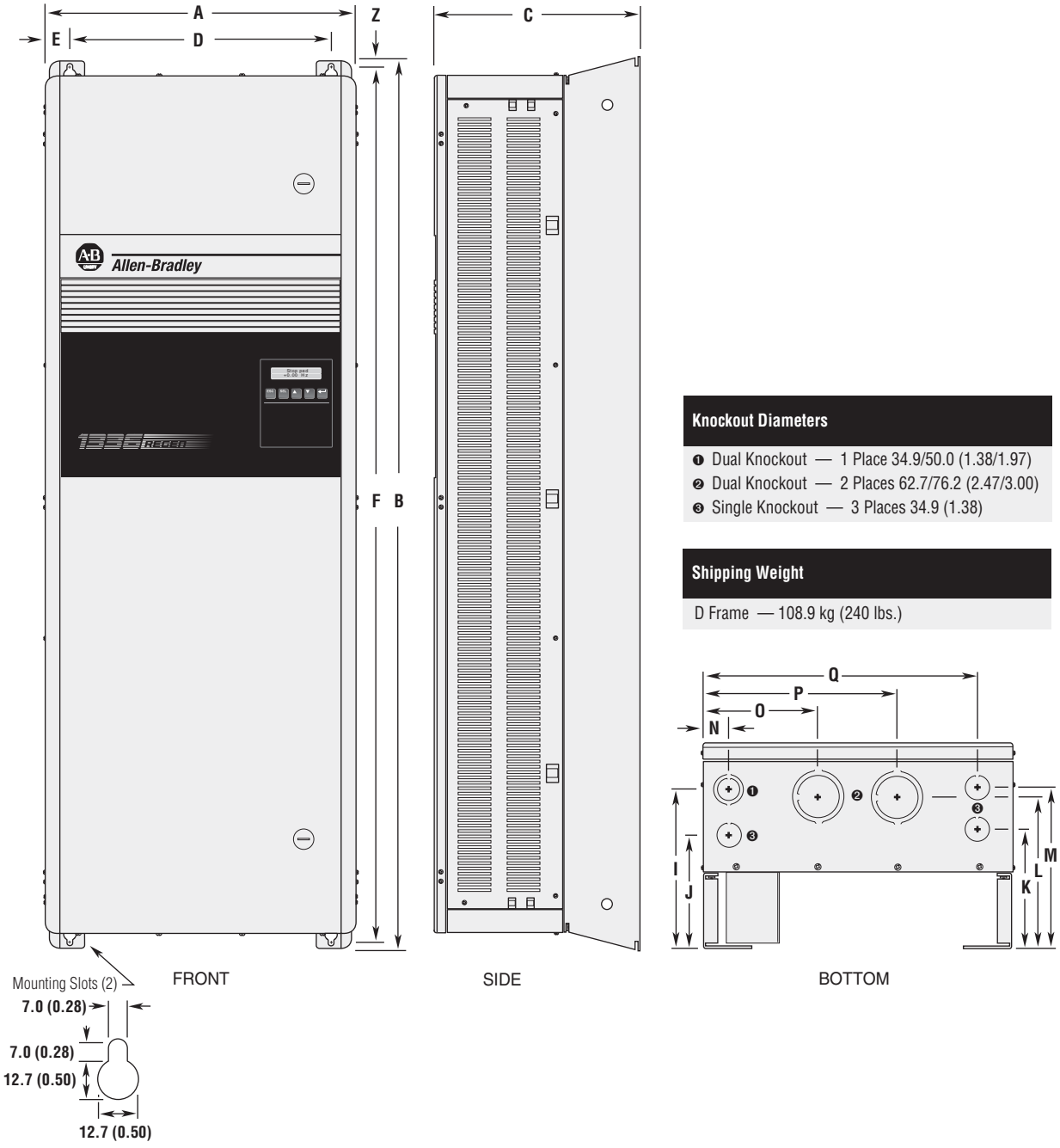
B Frame — 22.7 kg (50 lbs.)
C Frame — 38.6 kg (85 lbs.)

All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

Frame Reference	A	B	C	D	E	I	J	N	O	P	Q	Z
B	276.4 (10.88)	476.3 (18.75)	225.0 (8.86)	212.6 (8.37)	461.0 (18.15)	181.6 (7.15)	167.1 (6.58)	26.5 (1.04)	163.6 (6.44)	112.8 (4.44)	62.0 (2.44)	7.6 (0.30)
C	301.8 (11.88)	701.0 (27.60)	225.0 (8.86)	238.0 (9.37)	685.8 (27.00)	181.6 (7.15)	167.1 (6.58)	26.5 (1.04)	182.7 (7.19)	119.2 (4.69)	68.4 (2.69)	7.6 (0.30)

Figure 19 - 1336 REGEN D Frame Converter

IMPORTANT Allow 152.4 mm (6.0 in.) on all sides for proper heat dissipation.



Knockout Diameters

❶ Dual Knockout — 1 Place 34.9/50.0 (1.38/1.97)
❷ Dual Knockout — 2 Places 62.7/76.2 (2.47/3.00)
❸ Single Knockout — 3 Places 34.9 (1.38)

Shipping Weight

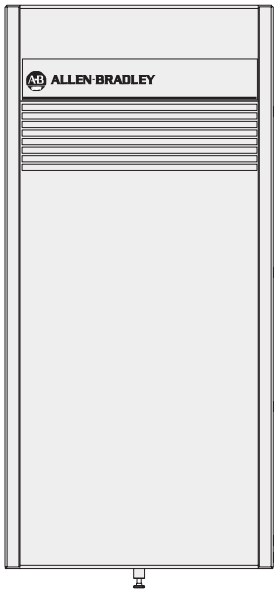
D Frame — 108.9 kg (240 lbs.)

All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

Frame Reference	A	B	C	D	E	F	I	J	K	L	M	N	O	P	Q	Z
D	381.5 (15.02)	1240.0 (48.82)	270.8 (10.66)	325.9 (12.83)	27.94 (1.10)	1216.2 (47.88)	198.1 (7.8)	131.6 (5.18)	153.7 (6.05)	169.4 (6.67)	204.5 (8.05)	52.1 (2.05)	144.0 (5.67)	261.4 (10.29)	343.9 (13.54)	11.94 (0.47)

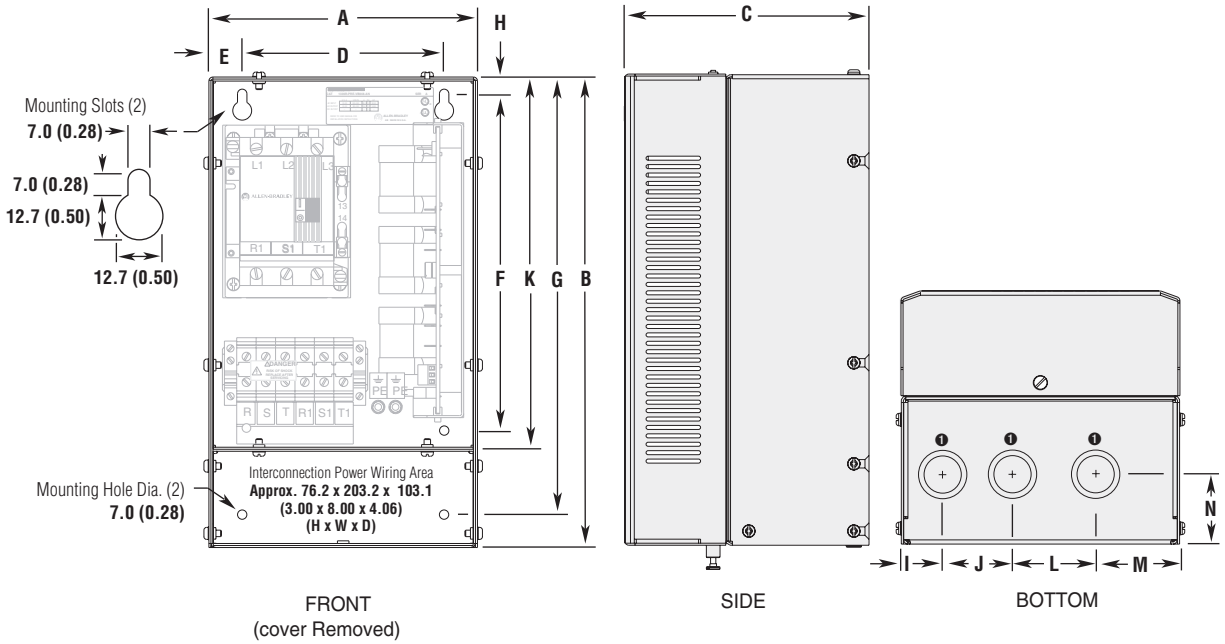
Figure 20 - 1336 REGEN B and C Frame Precharge Unit

IMPORTANT Allow 152.4 mm (6.0 in.) on all sides for proper heat dissipation.



Knockout Diameters
❶ Dual Knockout — 3 Places 28.6/34.9 (1.125/1.375)

Shipping Weight
B and C Frame — 9.1 kg (20 lbs.)

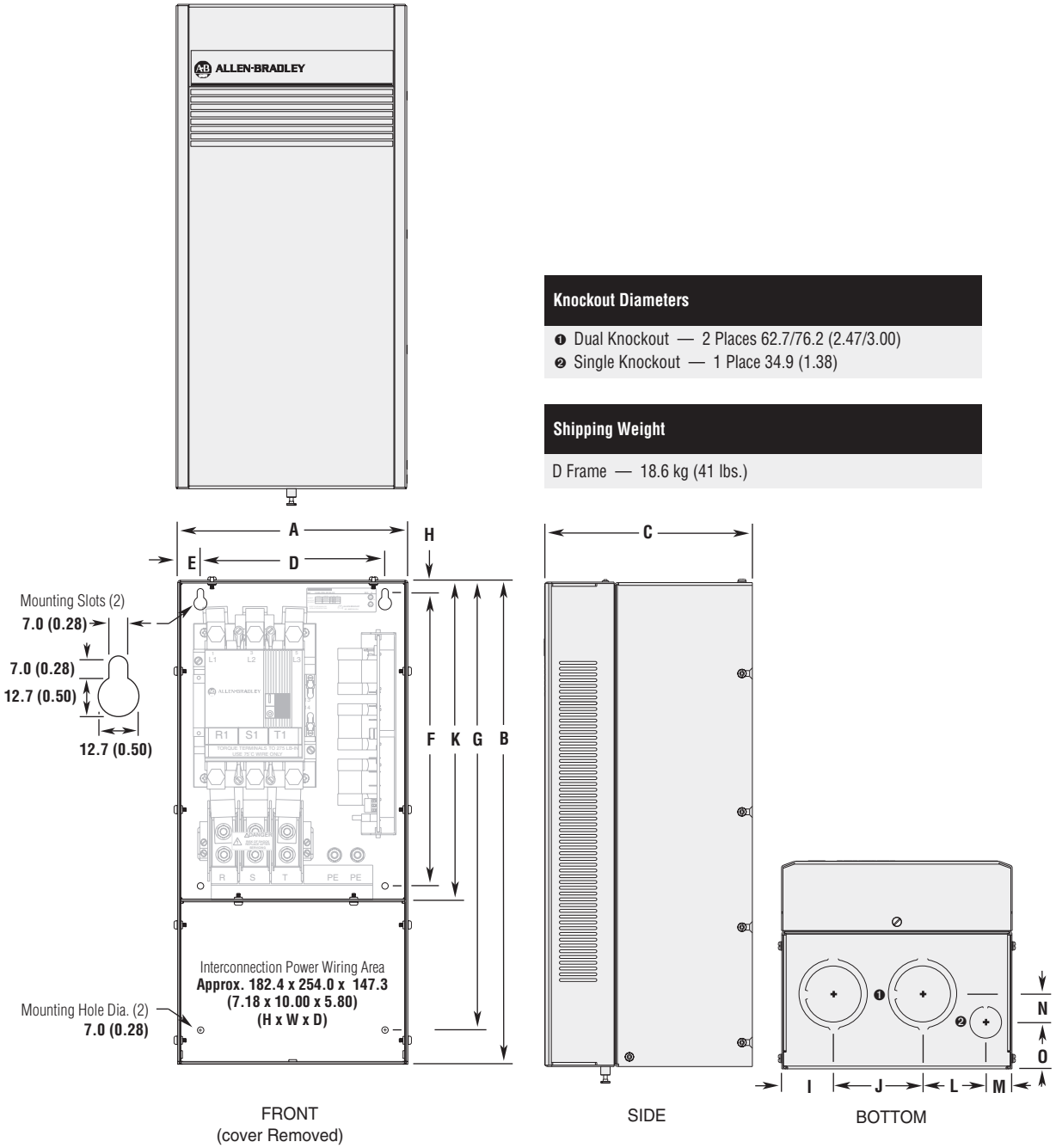


All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

Frame Reference	A	B	C	D	E	F	G	H	I	J	K	L	M	N
B and C	203.2 (8.00)	355.6 (14.00)	184.2 (7.25)	152.4 (6.00)	25.4 (1.00)	254.0 (10.00)	317.5 (12.50)	12.7 (0.50)	28.45 (1.12)	50.8 (2.00)	279.4 (11.0)	60.45 (2.38)	33.02 (1.30)	59.44 (2.34)

Figure 21 - 1336 REGEN D Frame Precharge Unit

IMPORTANT Allow 152.4 mm (6.0 in.) on all sides for proper heat dissipation.



Knockout Diameters

❶ Dual Knockout — 2 Places 62.7/76.2 (2.47/3.00)
❷ Single Knockout — 1 Place 34.9 (1.38)

Shipping Weight

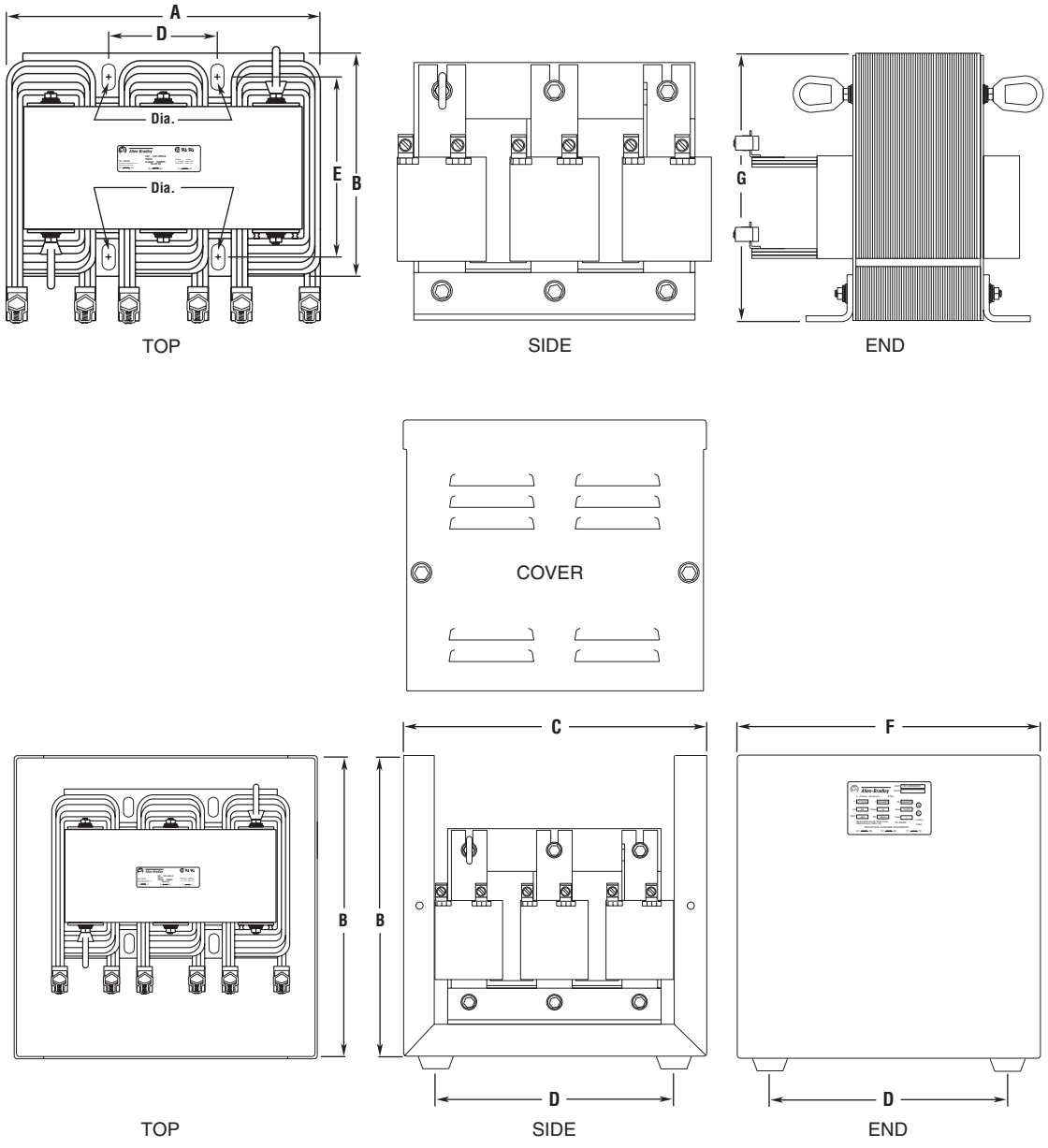
D Frame — 18.6 kg (41 lbs.)

All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

Frame Reference	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
D	254.0 (10.00)	533.4 (21.00)	228.6 (9.00)	203.2 (8.00)	25.4 (1.00)	323.9 (12.75)	482.6 (19.00)	12.7 (0.50)	53.9 (2.12)	98.6 (3.88)	350.0 (13.82)	69.9 (2.75)	31.8 (1.25)	31.8 (1.25)	50.8 (2.00)

Figure 22 - 1321 48 and 78A 3% Line Reactor

IMPORTANT Allow 152.4 mm (6.0 in.) on all sides for proper heat dissipation.

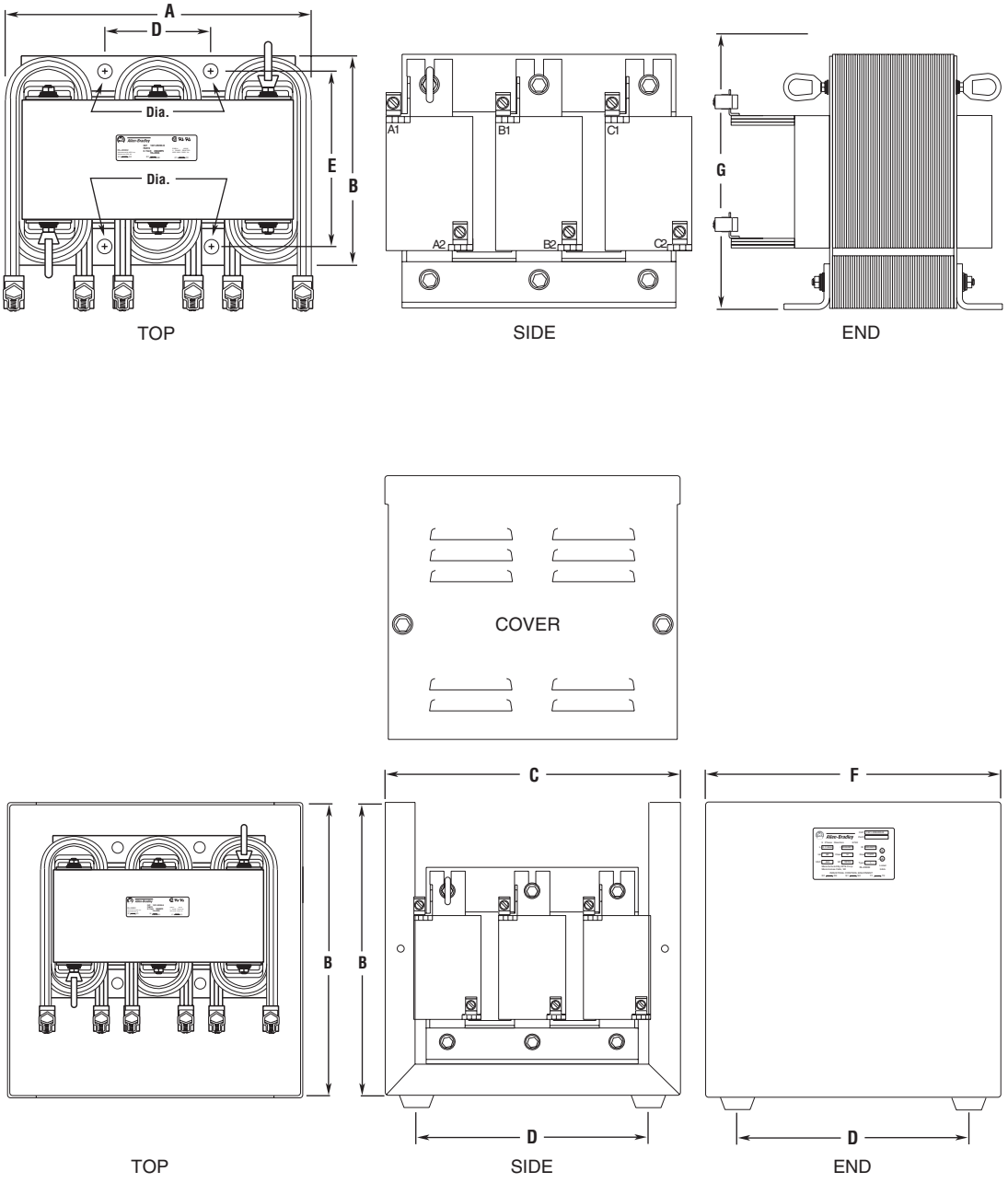


All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

1321 Rating	A	B	C	D	E	F	G	Mounting Hole Dia. (4) Places	Shipping Weight
48A Open (IP00)	229 (9.0)	118 (4.7)	—	76 (3.0)	80 (3.2)	—	187 (7.4)	9.5 (0.375)	12 (27)
78A Open (IP00)	274 (10.8)	144 (5.7)	—	92 (3.6)	93 (3.7)	—	210 (8.3)	12.7 (0.5)	23 (51)
48/78A NEMA Type 1 (IP20)	—	330 (13.0)	330 (13.0)	279 (11.0)	—	336 (13.2)	—	—	14.5/25.4 (32/56)

Figure 23 - 1321 180A 3% Line Reactor

IMPORTANT Allow 152.4 mm (6.0 in.) on all sides for proper heat dissipation.

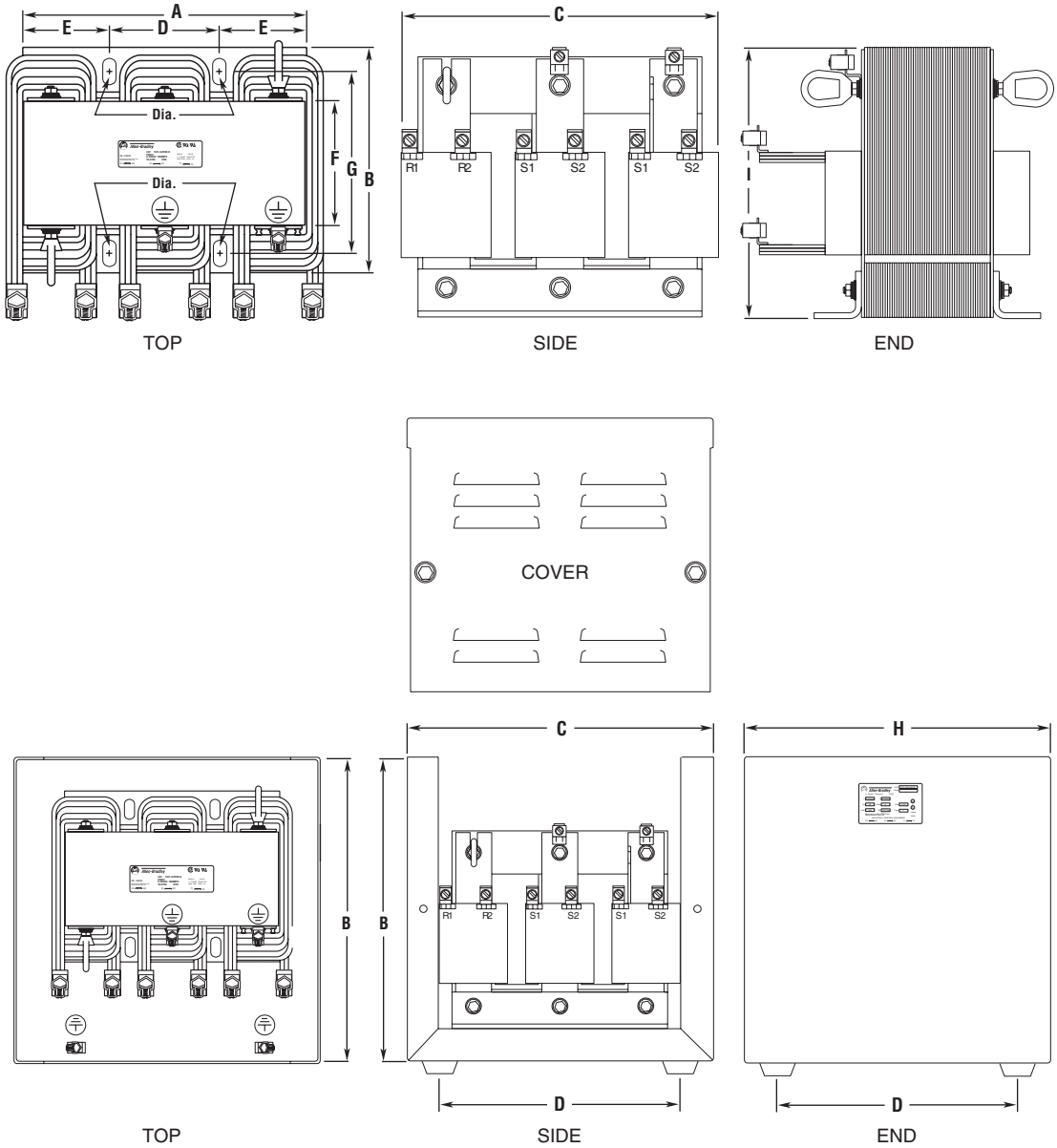


All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

1321 Rating	A	B	C	D	E	F	G	Mounting Hole Dia. (4) Places	Shipping Weight
180A Open (IP00)	274 (10.8)	210 (8.3)	—	92 (3.6)	112 (4.4)	—	211 (8.3)	14.22 (0.56)	31 (67)
180A NEMA Type 1 (IP20)	—	330 (13.0)	330 (13.0)	279 (11.0)	—	336 (13.2)	—	—	32.7 (72)

Figure 24 - 1321 48 and 78A 10% Line Reactor

IMPORTANT Allow 152.4 mm (6.0 in.) on all sides for proper heat dissipation.

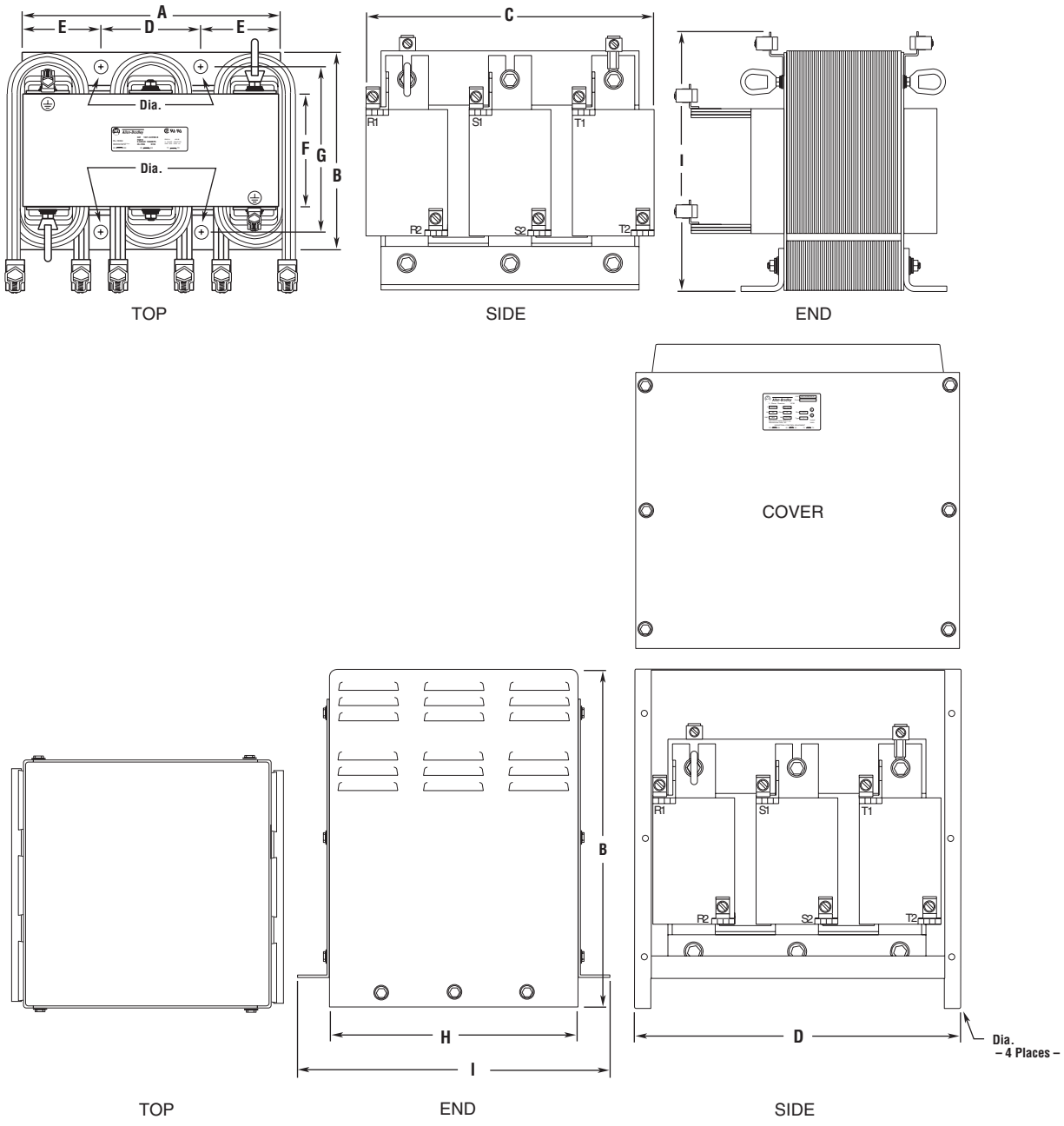


All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

1321 Rating	A	B	C	D	E	F	G	H	I	Mounting Hole Dia. (4) Places	Shipping Weight
48A Open (IP00)	304.8 (9.00)	207.3 (8.16)	279.4 (11.00)	92.2 (3.63)	68.33 (2.69)	114.3 (4.50)	156.5 (6.16)	—	215.9 (8.50)	0.38 x 0.75 (9.7 x 19 Slot)	36.3 (80)
78A Open (IP00)	304.8 (9.00)	232.7 (9.16)	279.4 (11.00)	92.2 (3.63)	68.33 (2.69)	139.7 (5.50)	181.9 (7.16)	—	215.9 (8.50)	0.38 x 0.75 (9.7 x 19 Slot)	59 (130)
48 NEMA Type 1 (IP20)	—	330.2 (13.00)	330 (13.0)	279 (11.0)	—	—	—	335.8 (13.22)	—	—	38.6 (85)

Figure 25 - 1321 180A 10% Line Reactor

IMPORTANT Allow 152.4 mm (6.0 in.) on all sides for proper heat dissipation.

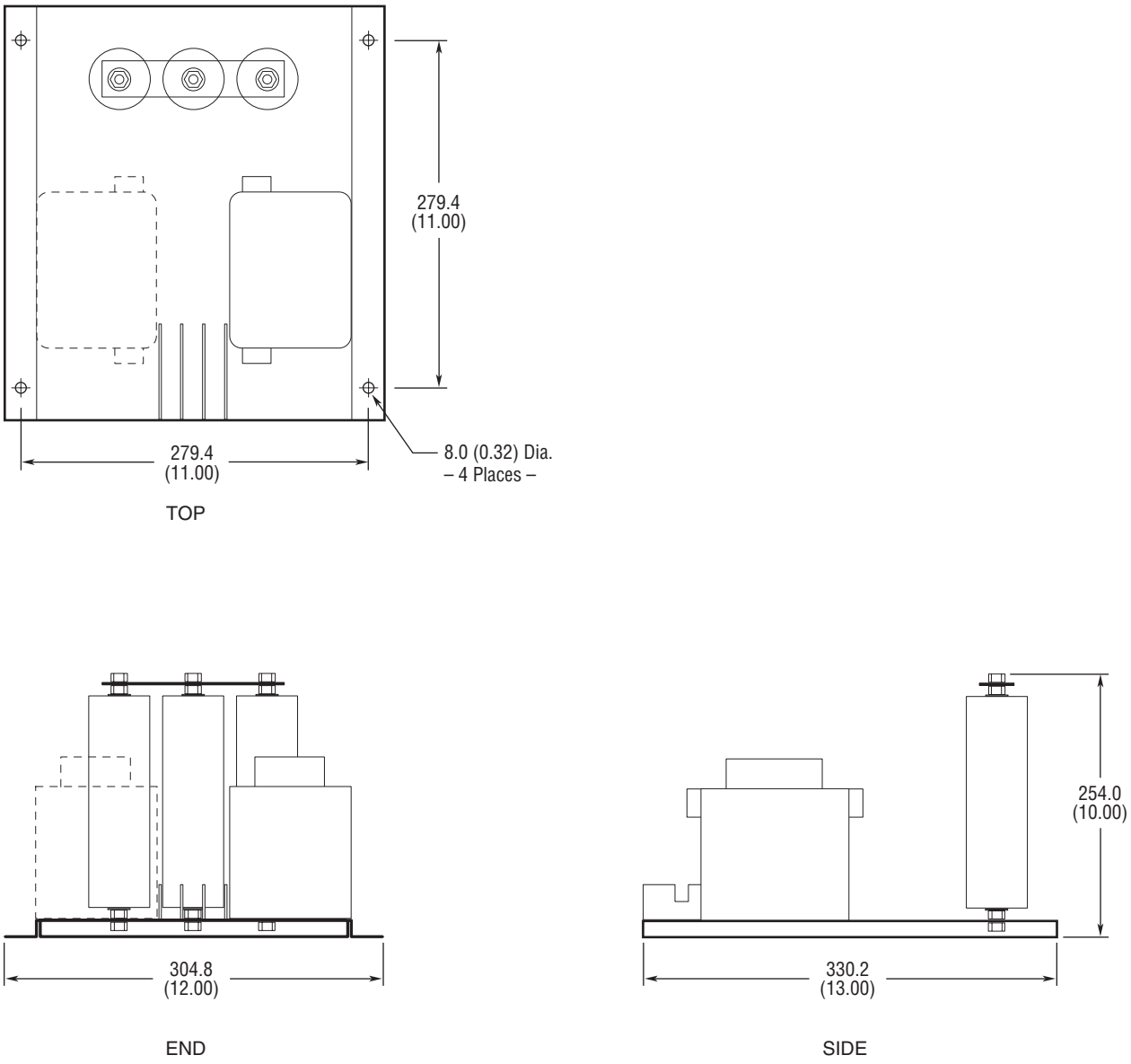


All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

1321 Rating	A	B	C	D	E	F	G	H	I	Mounting Hole Dia. (4) Places	Shipping Weight
180A Open (IP00)	304.8 (12.00)	292.4 (11.51)	368.3 (14.50)	116.8 (4.60)	94.0 (3.70)	184.2 (7.25)	254.3 (10.01)	—	317.5 (12.50)	14.22 (0.56)	136 (300)
78A/180A NEMA Type 1 (IP20)	—	609.6 (24.00)	—	434.9 (17.12)	—	—	—	432 (17.0)	467 (18.38)	11.18 x 17.53 (0.44 x 0.69 Slot)	61.2/160 (135/353)

Figure 26 - 1321 Power Line Filter

Note: All ratings are Open (IP00).



All Dimensions in Millimeters and (Inches)

Figure 27 - 1336 REGEN B Frame Through-the-Back Heat Sink Mounting

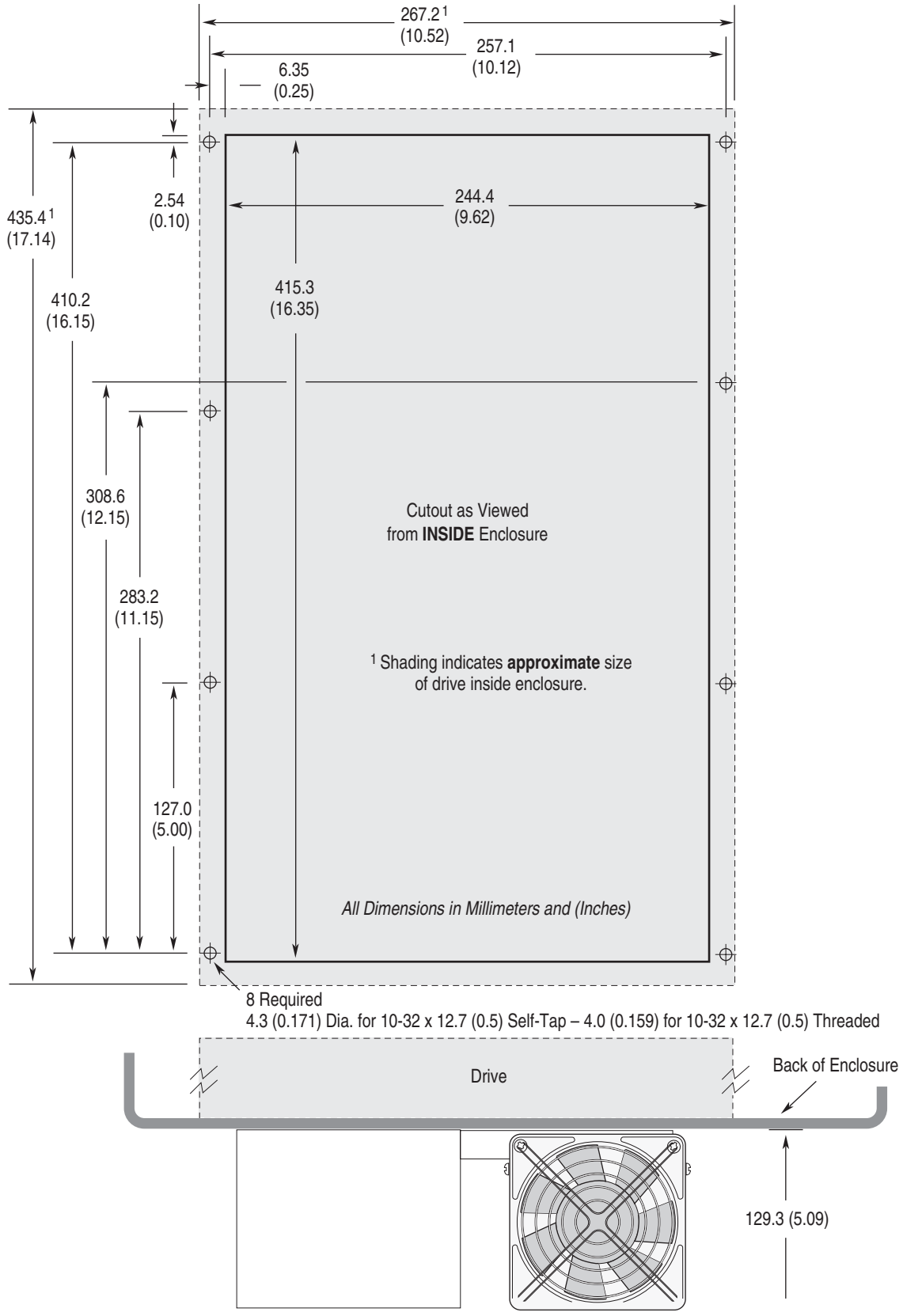


Figure 28 - 1336 REGEN C Frame Through-the-Back Heat Sink Mounting

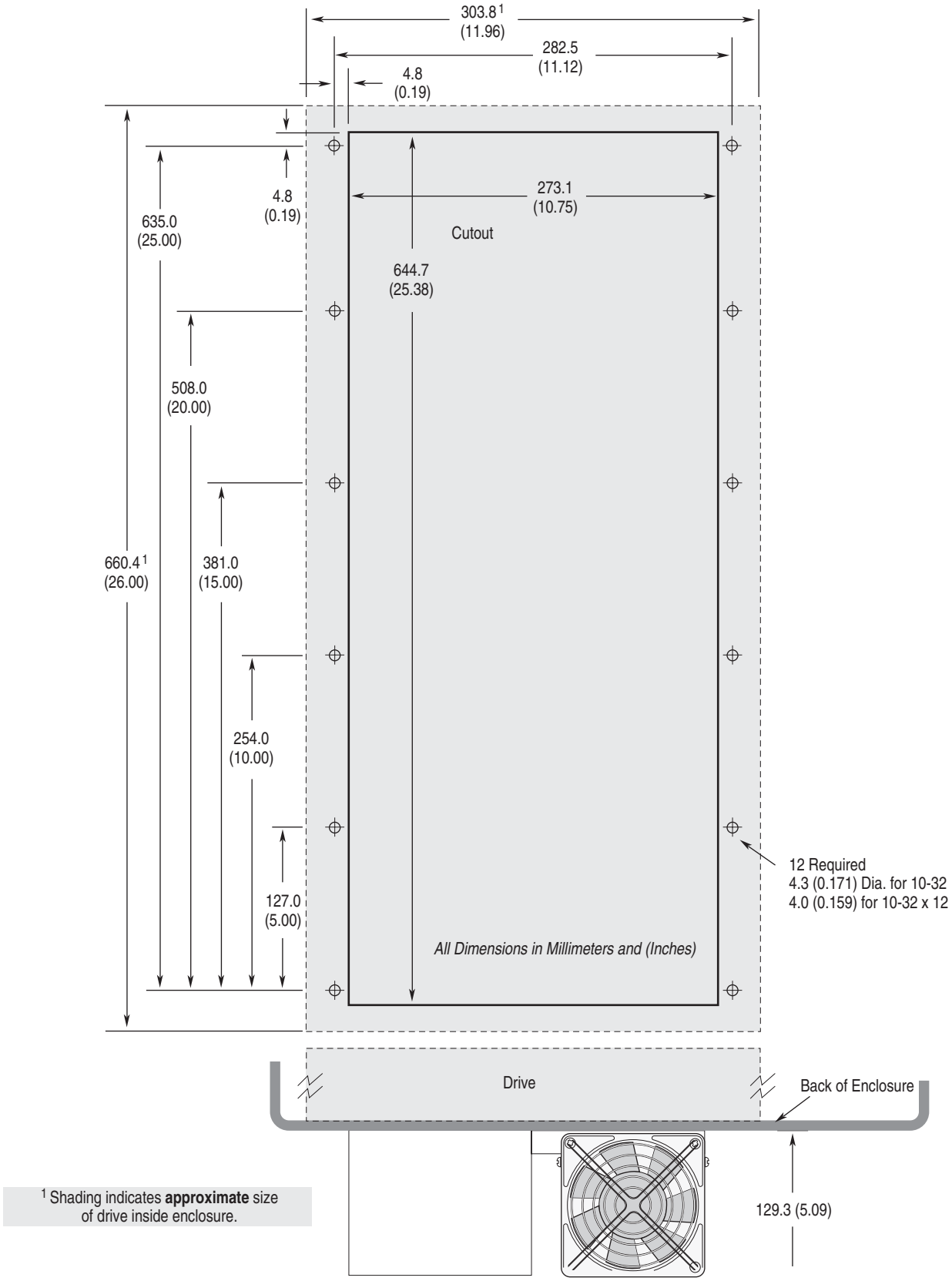
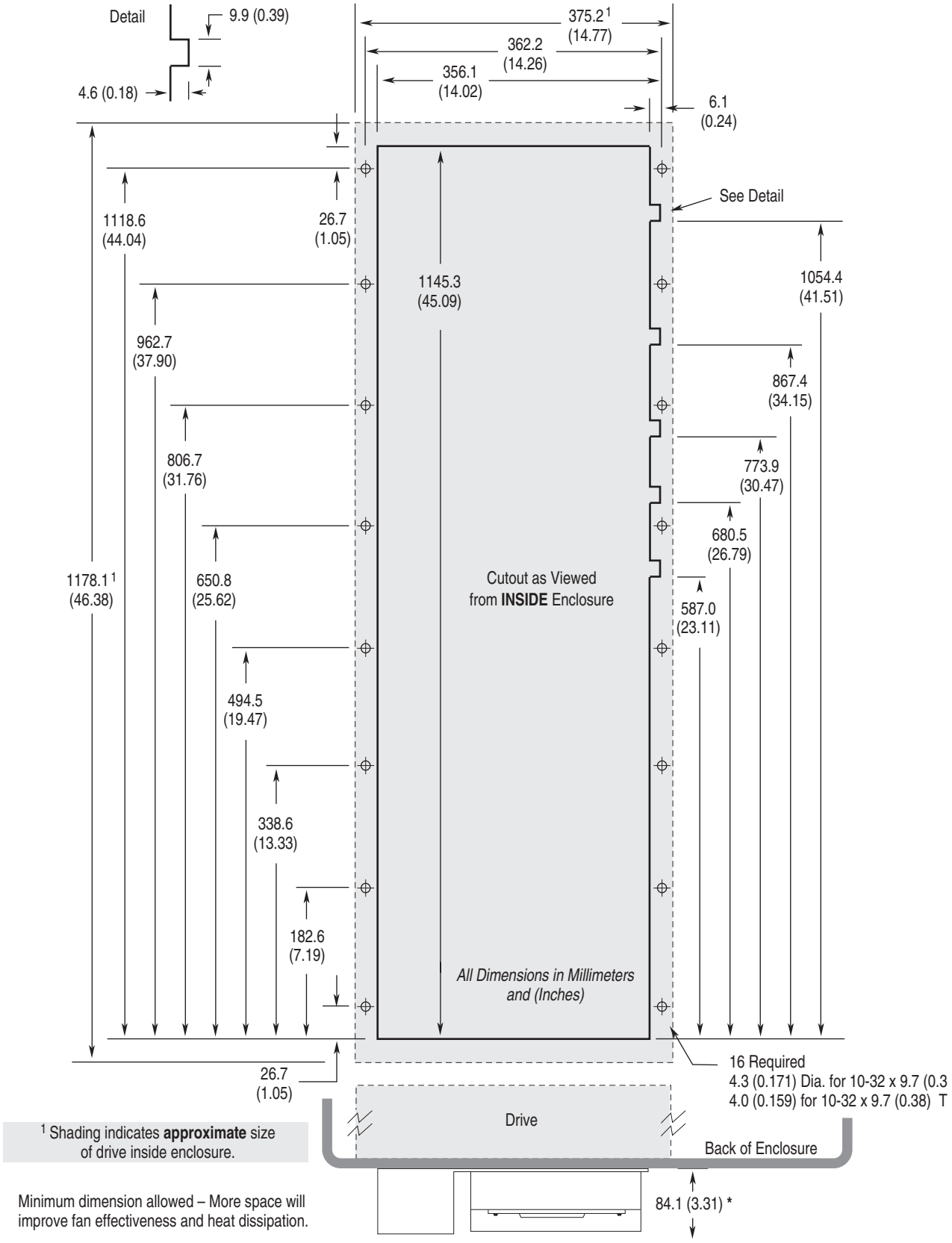


Figure 29 - 1336 REGEN D Frame Through-the-Back Heat Sink Mounting



8720MC-RPS Regenerative Power Supply Package

It is important to properly plan before installing the 8720MC-RPS Regenerative Power Supply to ensure that the environment and operating conditions of the units are satisfactory. Read this section for important environment and operating conditions information.

Environmental Conditions to be Met

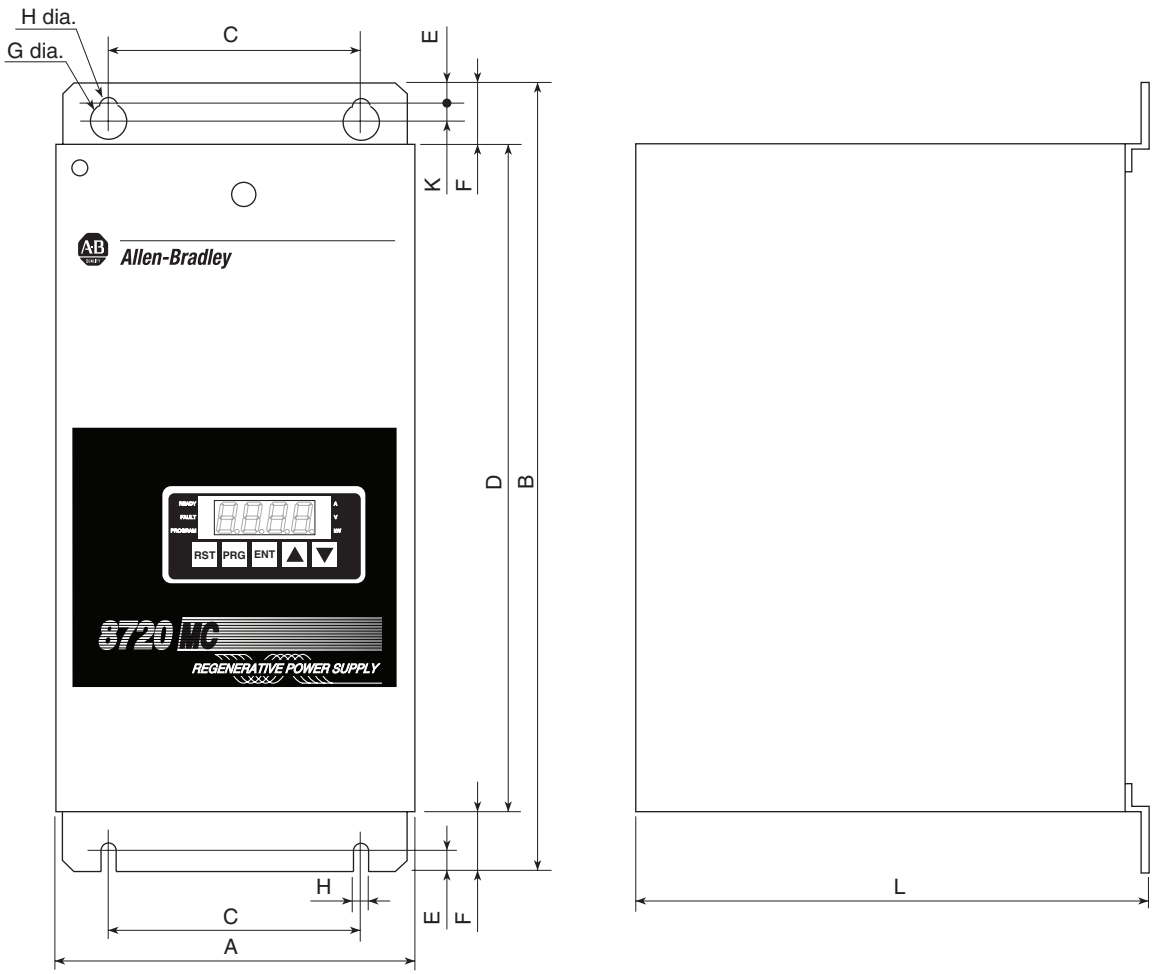
The Declaration of Conformity with the requirements for CE Mark was issued for the following units, and these units must be used in a cabinet.

- 8720MC-RPS027BM (no longer available)
- 8720MC-RPS065BM, 8720MC-RPS065BS
- 8720MC-RPS190BM and 8720MC-RPS190BS

Also, before deciding on an installation site, consider the following guidelines:

- Verify that the units can be kept clean, cool, and dry.
- Be sure that the units are always away from oil, metal powder, other airborne contaminants, and direct sunlight.
- Check that the units will not be exposed to excessive vibration and noise, and that they will not be close to instruments sensitive to electrical noise.
- The area chosen should allow the space required for proper air flow as defined in Figure 36.
- Check that the temperatures within the vicinity of the units are between 10 to 50 °C (14 to 122 °F). In case of 8720MC-RPS190, however, the ambient temperature must be between -10 to 40 °C (14 to 104 °F).
- Check that the relative humidity is between 5 and 95% without condensation.
- Do not install the units above 1000 meters (3300 feet) without derating output power. For every 300 meters (1000 feet) above 1000 meters (3300 feet), derate the output power 4%. When you need to install the units above 1500 meters (5000 feet), contact Rockwell Automation.

Figure 30 - Overall Dimensions of a Single Unit of Model 8720MC-RPS065 Unit



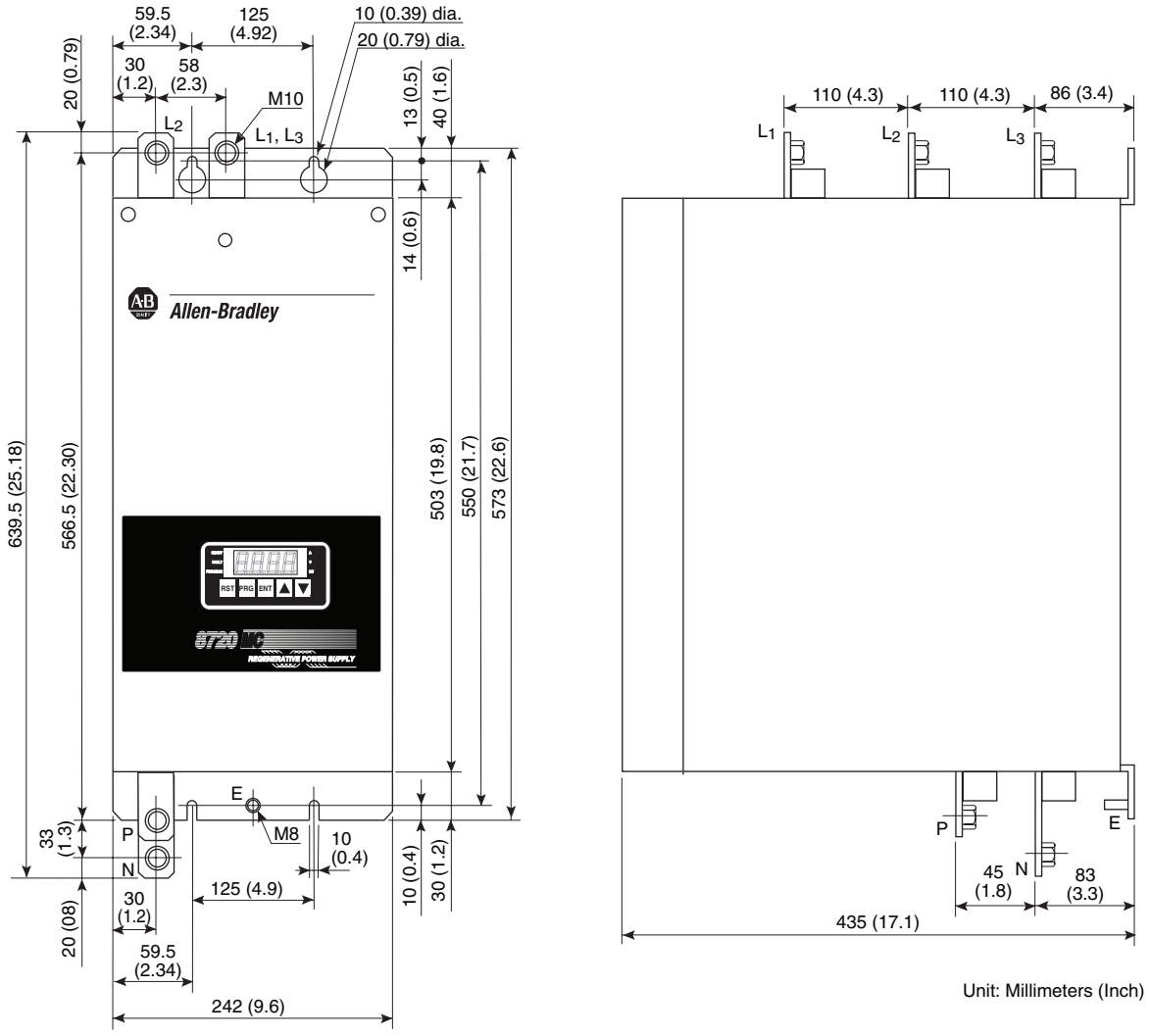
Model	A	B	C	D	E	F	G	H	K	L
8720MC-RPS065	179.4 (7.06)	395 (15.6)	127 (5.0)	333.2 (131.2)	10 (0.39)	30 (1.2)	18 (0.71)	9 (0.35)	9 (0.35)	318.3 (12.53)
8720MC-RPS027	No longer available.									

Unit: Millimeter (Inch)

IMPORTANT The 8720MC-RPS027 unit is no longer available.

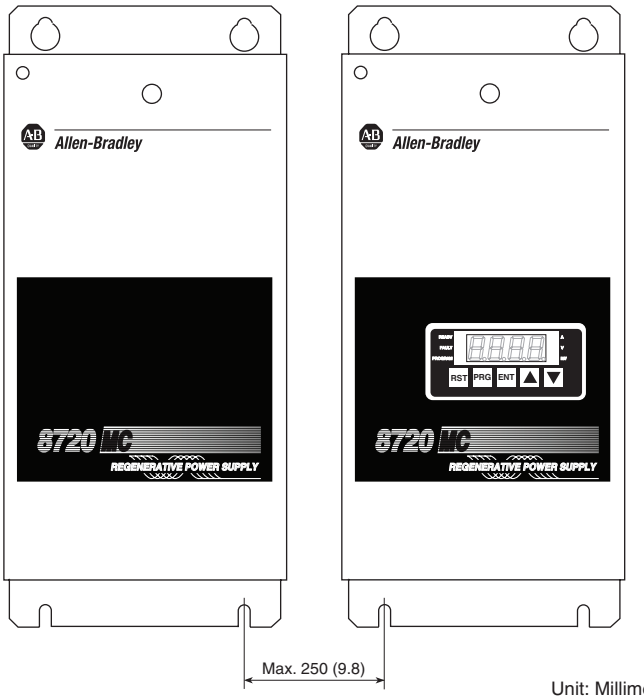
Note: 8720MC-RPS065BM shown above.

Figure 31 - Overall Dimensions of a Single Unit of Model 8720MC-RPS190 Unit



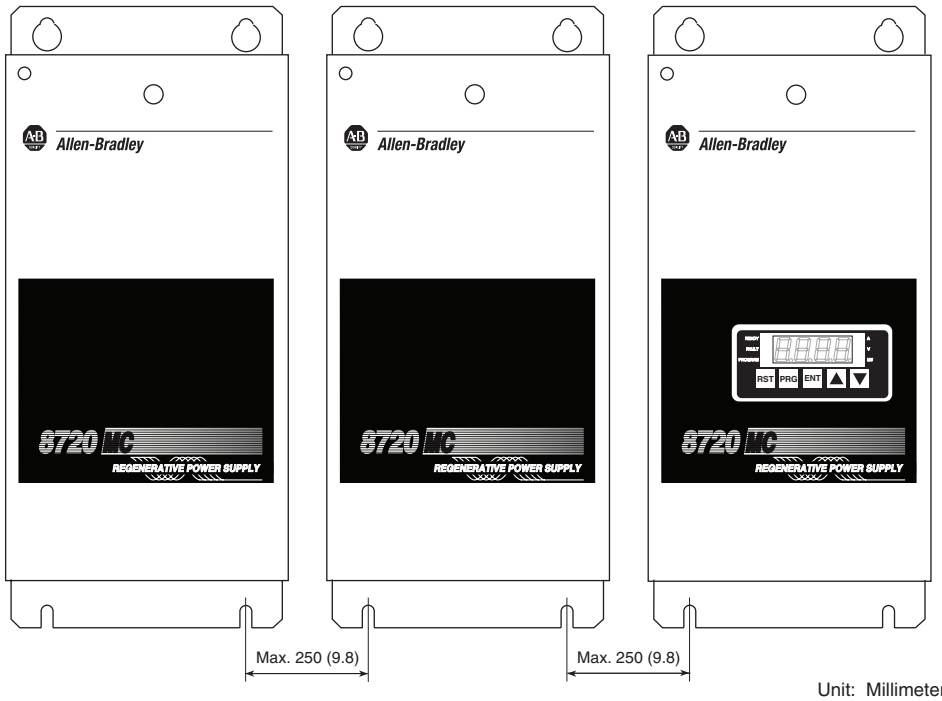
Note: 8720MC-RPS190BM shown above.

Figure 32 - Required Distance between Units in Case of Two Paralleled Units of Model 8720MC-RPS065 Units



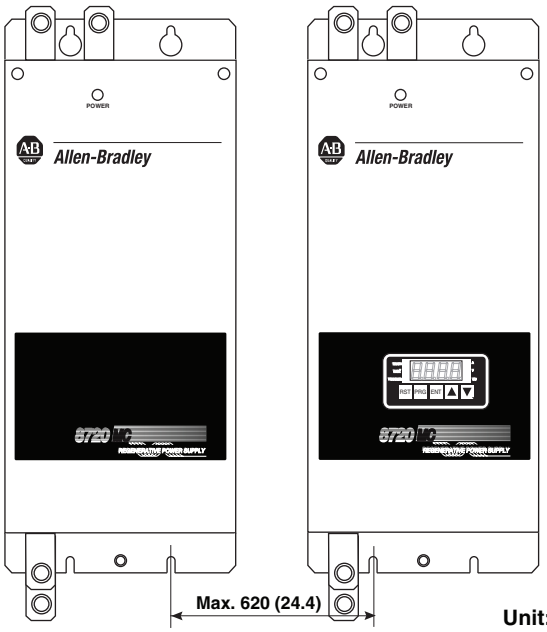
Note: In case two units of Model 8720MC-RPS065 unit are installed in parallel, the master unit must be on the right side as shown above.

Figure 33 - Required Distance between Units in Case of Three Paralleled Units of Model 8720MC-RPS065 Units



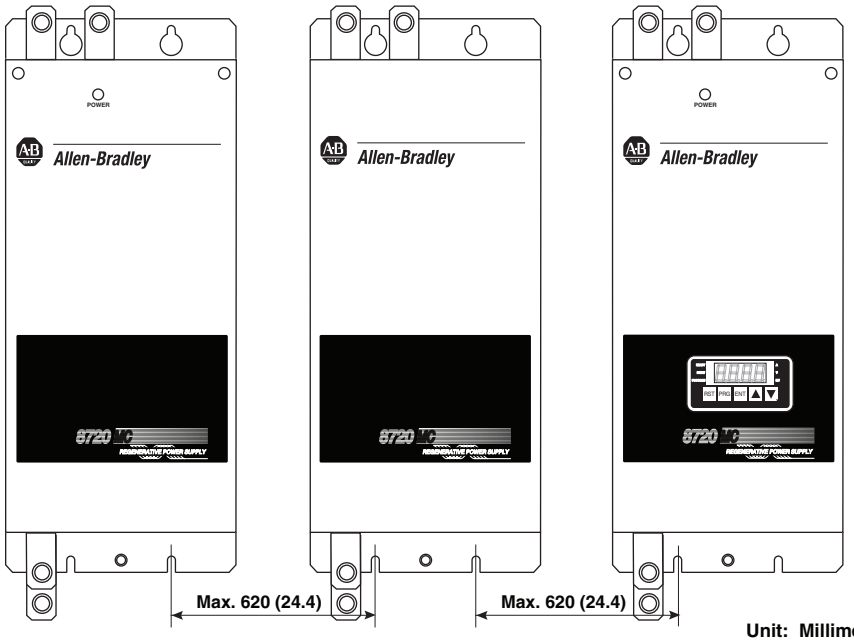
Note: In case three units of Model 8720MC-RPS065 unit are installed in parallel, the master unit must be installed at the rightmost end as shown above.

Figure 34 - Required Distance between Units in Case of Two Paralleled Units of Model 8720MC-RPS190 Unit



Note: In case two units of Model 8720MC-RPS190 unit are installed in parallel, the master unit must be installed on the right hand side as shown in the above.

Figure 35 - Required Distance between Units in Case of Three Paralleled Units of Model 8720MC-RPS190 Unit

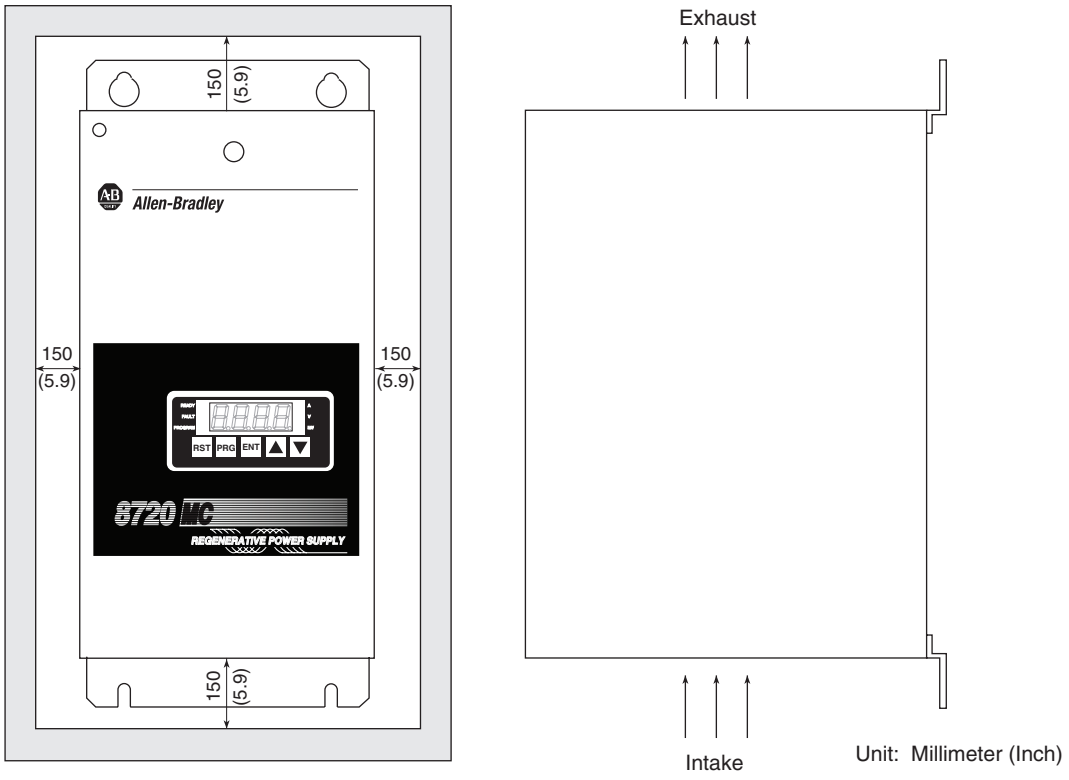


Note: In case three units of Model 8720MC-RPS190 unit are installed in parallel, the master unit must be installed at the rightmost end as shown in the above.

8720MC-RPS Recommended Air Flow Clearance

Be sure that there is adequate clearance for air ventilation around the 8720MC-RPS Regenerative Power Supply. Cooling air flows from the bottom to the top of the units. For best cooling effect, do not mount the 8720MC-RPS Regenerative Power Supply directly above each other. Figure 36 shows recommended air flow clearance.

Figure 36 - 8720MC-RPS Recommended Air Flow Clearance



8720MC-RPS065 Reactors

Figure 37 shows the dimensional outline drawing of the recommended reactors for Model 8720MC-RPS065BM and 8720MC-RPS065BS units.

Figure 37 - 8720MC-RPS065 Reactors

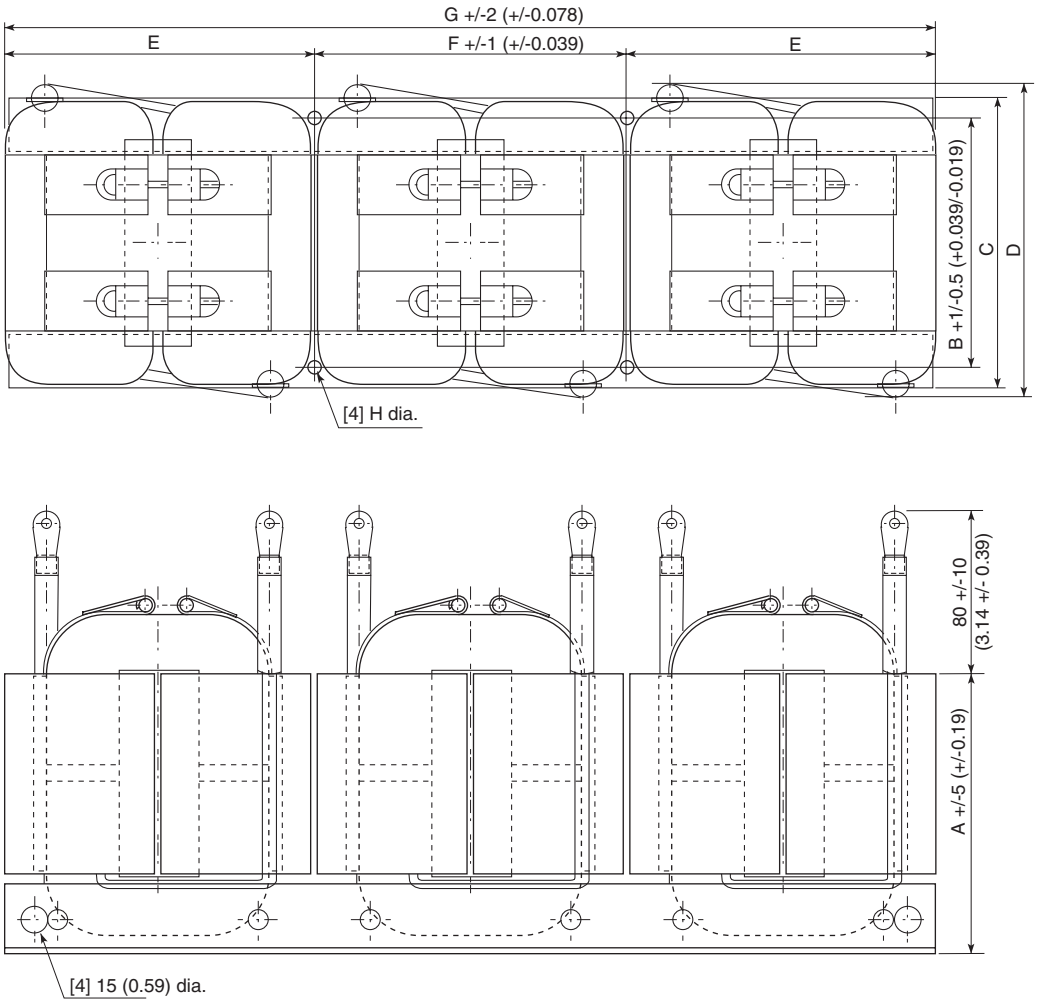
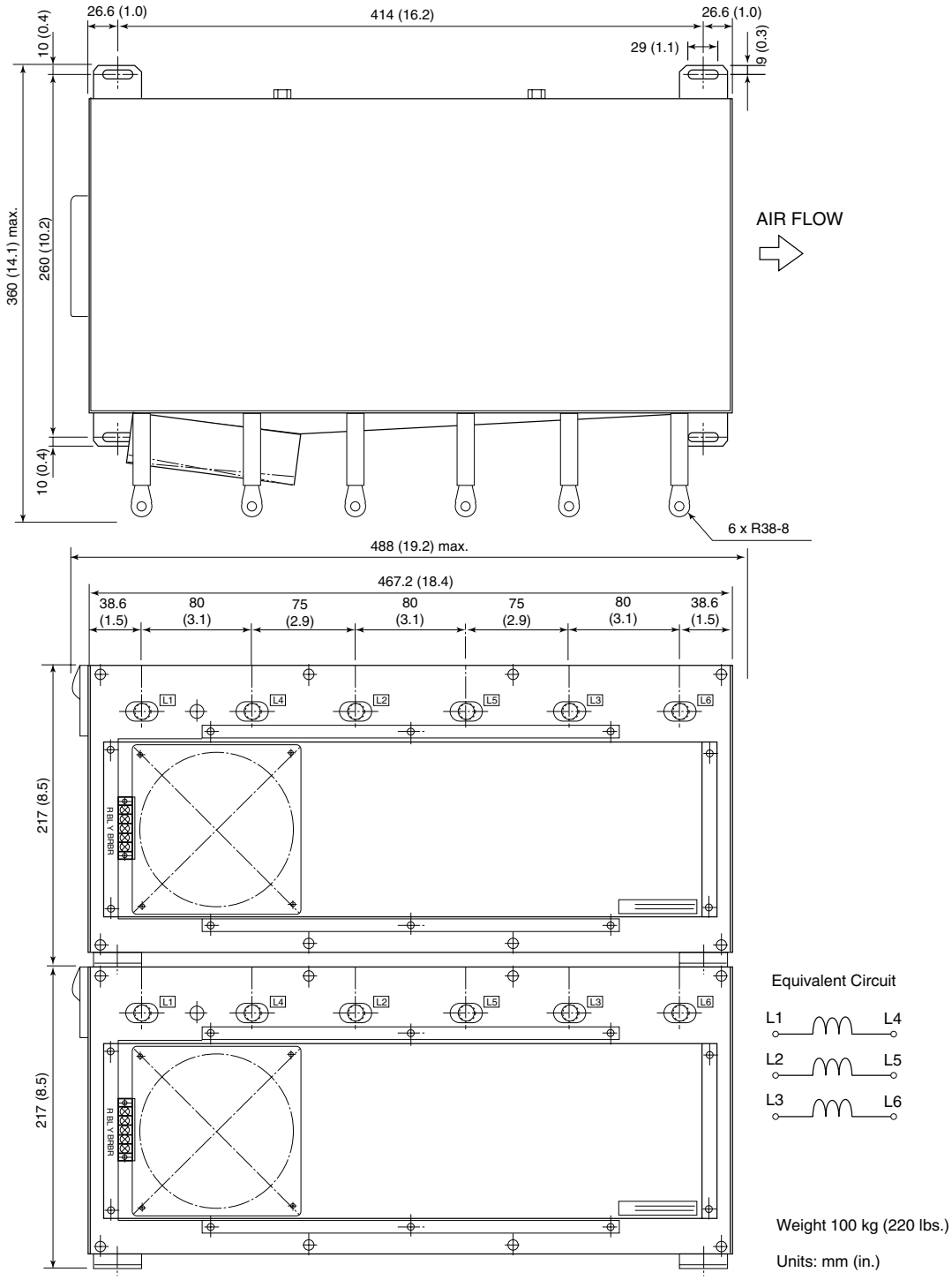


Table 15 - 8720MC-RPS Reactor Dimensions, mm (in.)

Model	A	B	C	D	E	F	G	H	Weight, kg (lb)
8720MC-LR14-070B	140 (5.5)	125 (4.9)	145 (5.7)	Max. 180 (7.1)	155 (6.1)	150 (5.9)	460 (18.1)	9.5 (0.37)	38 (83.7)
8720MC-LR10-062B	125 (4.9)	110 (4.3)	130 (5.1)	Max. 160 (6.3)	145 (5.7)	150 (5.9)	440 (17.3)	9.5 (0.37)	27 (59.5)
8720MC-LR05-048B	125 (4.9)	105 (4.1)	125 (4.9)	Max. 155 (6.1)	132.5 (5.2)	135 (5.3)	400 (15.7)	7 (0.27)	21 (46.2)
8720MC-LR03-032B	127 (5.0)	100 (3.9)	120 (4.7)	Max. 140 (5.5)	112.5 (4.4)	120 (4.7)	345 (13.5)	7 (0.27)	17 (37.4)

Figure 38 shows the dimensional outline drawing of the recommended ACL units (AC reactor assemblies, Model 8720MC-LR10-100B) for Model 8720MC-RPS190BM and 8720MC-RPS190BS units.

Figure 38 - 8720MC-RPS190 AC Reactor Assemblies (ACL units)

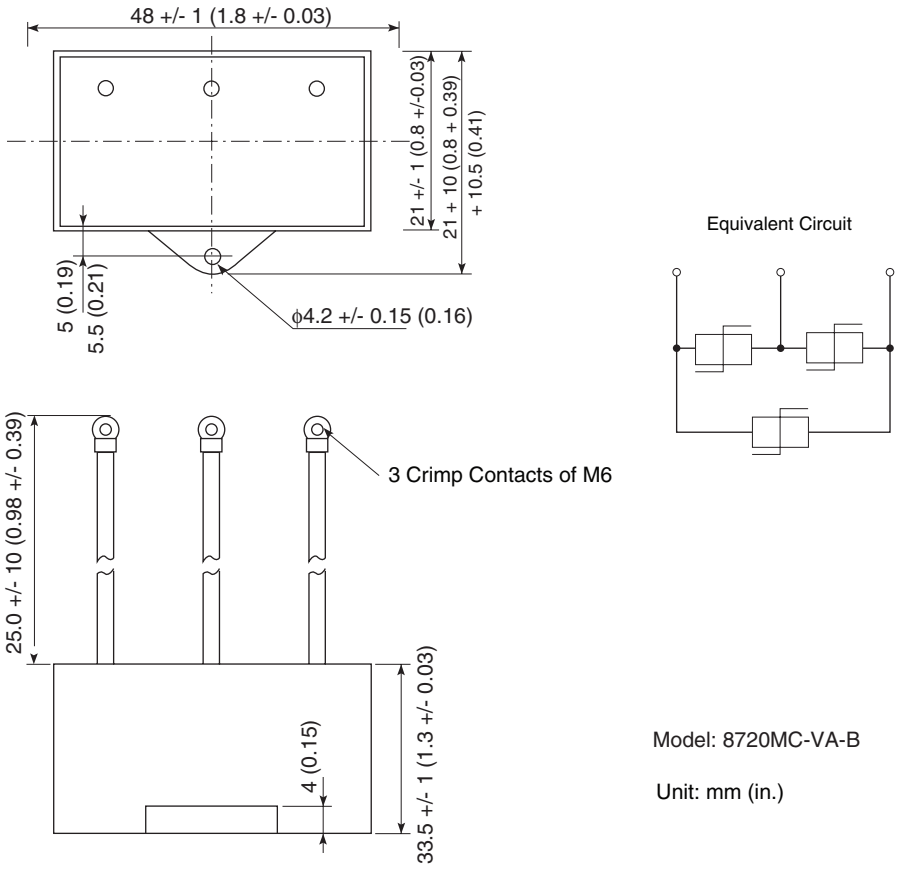


Note: Shown are two (QTY 2), 8720MC-LR10-100B ACL units. When ordering, be sure to order two 8720MC-LR10-100B ACL units.

8720MC-RPS065 Varistors

Figure 39 shows the dimensional outline drawing of the varistors to be used for Model 8720MC-RPS065BM and 8720MC-RPS065BS units.

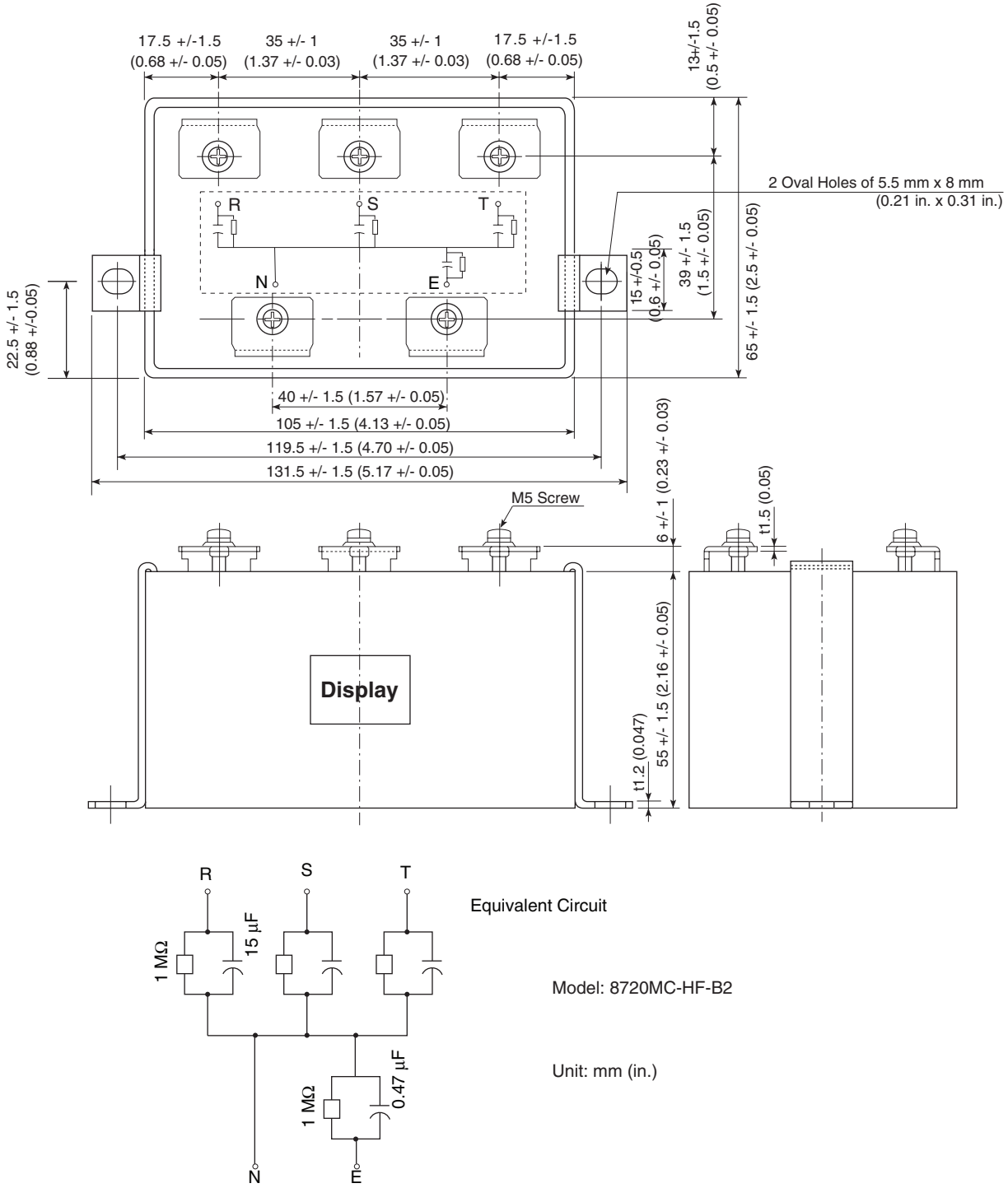
Figure 39 - 8720MC-RPS065 Varistors



8720MC-RPS065 Harmonic Filters

Figure 40 shows the dimensional outline drawing of the recommended harmonic filters to be used for Model 8720MC-RPS065BM and 8720MC-RPS065BS units.

Figure 40 - 8720MC-RPS065 Harmonic Filter



8720MC-RPS065 Line Filter (Schaffner)

Figure 41 and Figure 42 show the dimensional outline drawing of the recommended line filters for AC input power to be used for Model 8720MC-RPS065BM and 8720MC-RPS065BS units when these units must conform with the requirements of CE Mark. Figure 41 shows Schaffner products, and Figure 42 shows Soshin Electric products.

Figure 41 - 8720MC-RPS065 Line Filter (Schaffner)

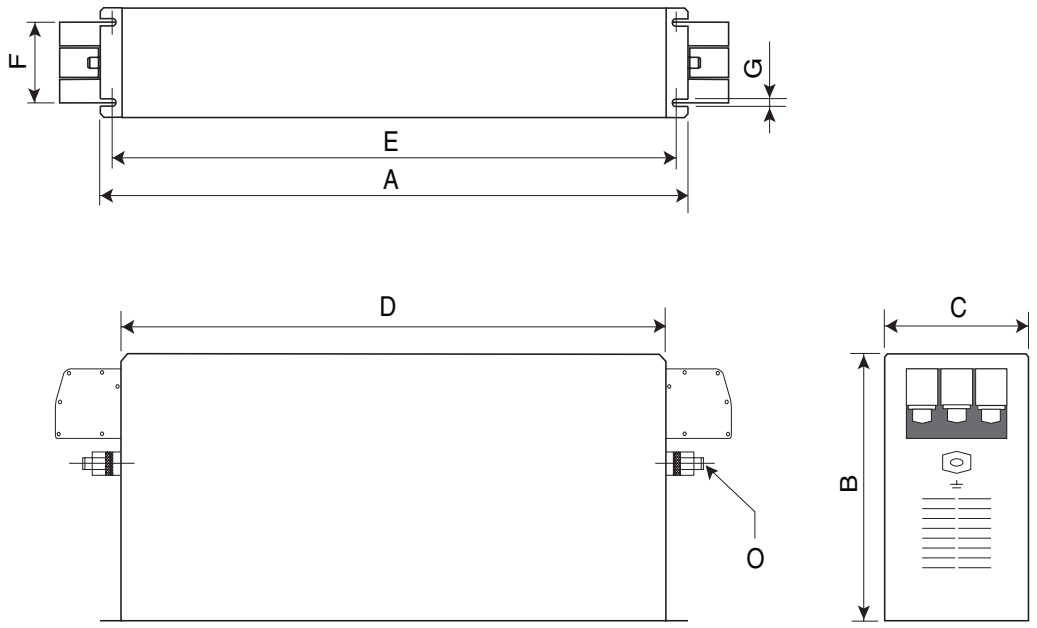


Table 16 - 8720MC-RPS Line Filter (Schaffner) Dimensions, mm (in.)

Model	A	B	C	D	E	F	G	O
FN3100-80-35	379 (14.9)	220 (8.6)	90 (3.5)	350 (13.7)	364 (14.3)	65 (2.5)	6.5 (0.25)	M10

8720MC-RPS065 Line Filter (Soshin Electric)

Figure 42 - 8720MC-RPS Line Filter (Soshin Electric)

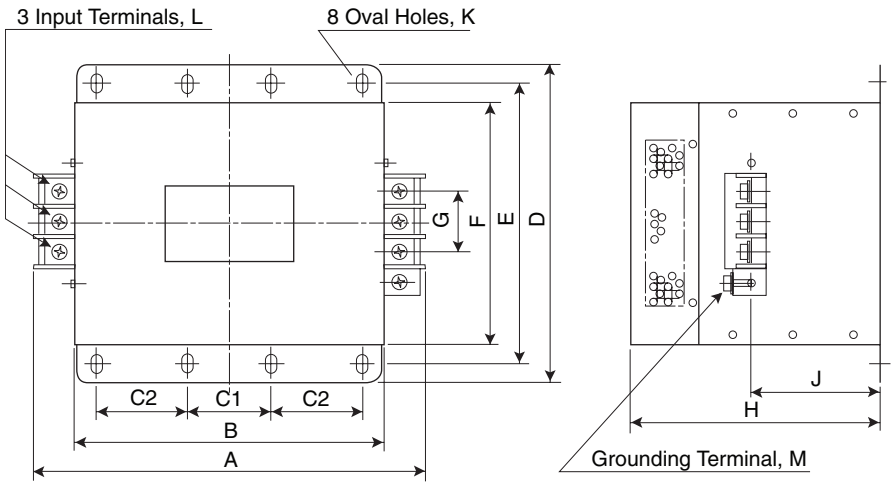


Table 17 - 8720MC-RPS Line Filter (Soshin Electric) Dimensions, mm (in.)

Model	A	B	C1	C2	D	E	F
HF3080C-TOA	405 +/- 5 (15.9 +/- 0.19)	350 +/- 2 (13.7 +/- 0.07)	100 +/- 1 (3.9 +/- 0.03)	100 +/ 1 (3.9 +/ 0.03)	220 +/- 2 (8.6 +/- 0.07)	200 +/- 1 (7.8 +/- 0.03)	180 +/- 2 (7.0 +/0.07)

Model	G	H	J	K	L	M
HF3080C-TOA	56 +/-1 (2.20 +/- 0.03)	210 +/-2 (8.26 +/- 0.07)	135 +/-2 (5.31 +/- 0.07)	4.25 R x 12 long (0.16 R x 0.47 long)	M8	M6

8720MC-RPS190 EMC Filter

Figure 43 shows the outline dimensions of Model 8720MC-EF190-VB EMC filter unit for Model 8720MC-RPS190BM and 8720MC-RPS190BS units. The Model 8720MC-EF190-VB unit includes the varistor, magnetic contactor, harmonic filter, line filter, grounding capacitor, fan and MC interface card and cable assembly for this unit. The connection diagram of Model 8720MC-EF190-VB EMC filter unit is shown in Figure 44.

Figure 43 - 8720MC-RPS190 EMC Filter

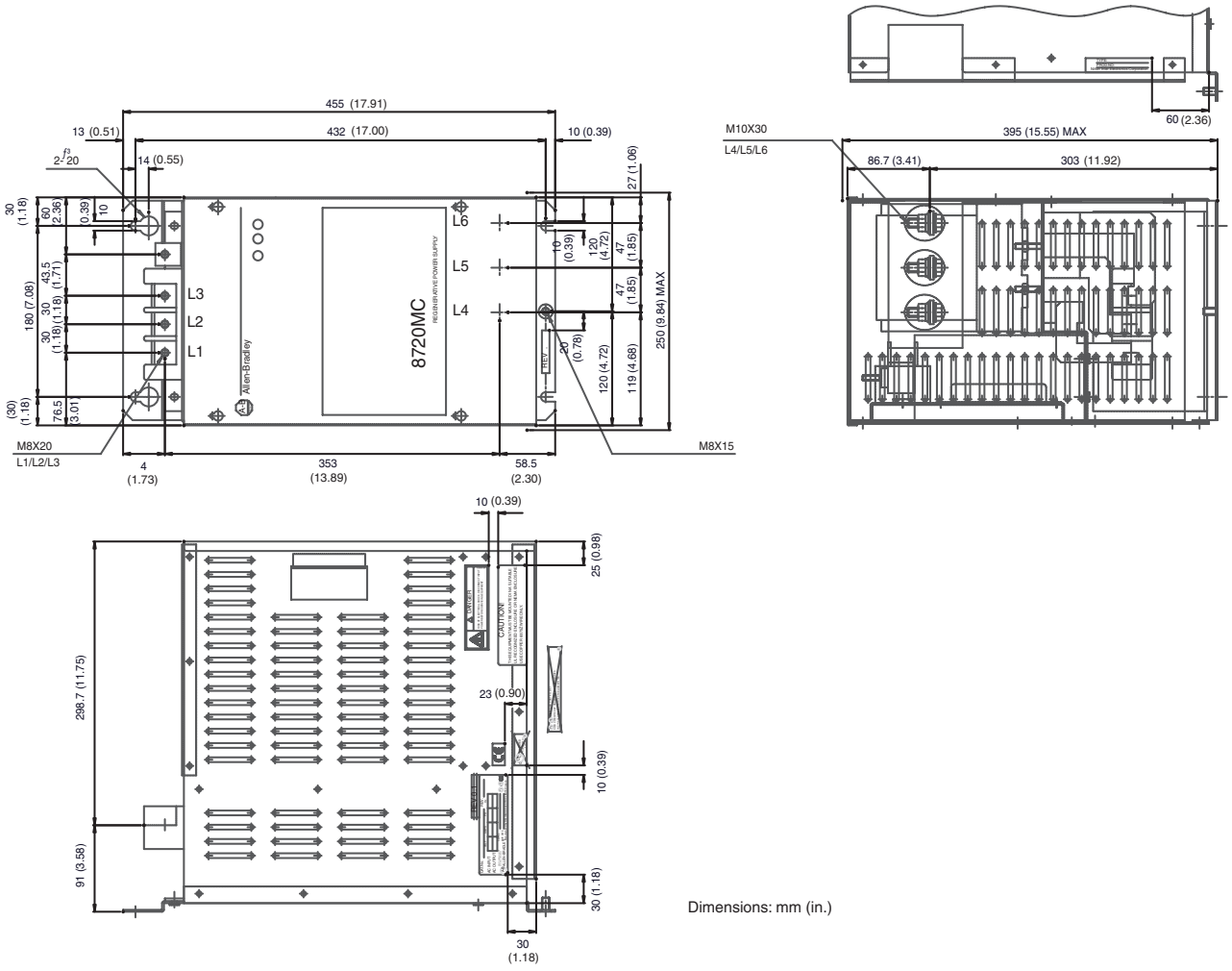
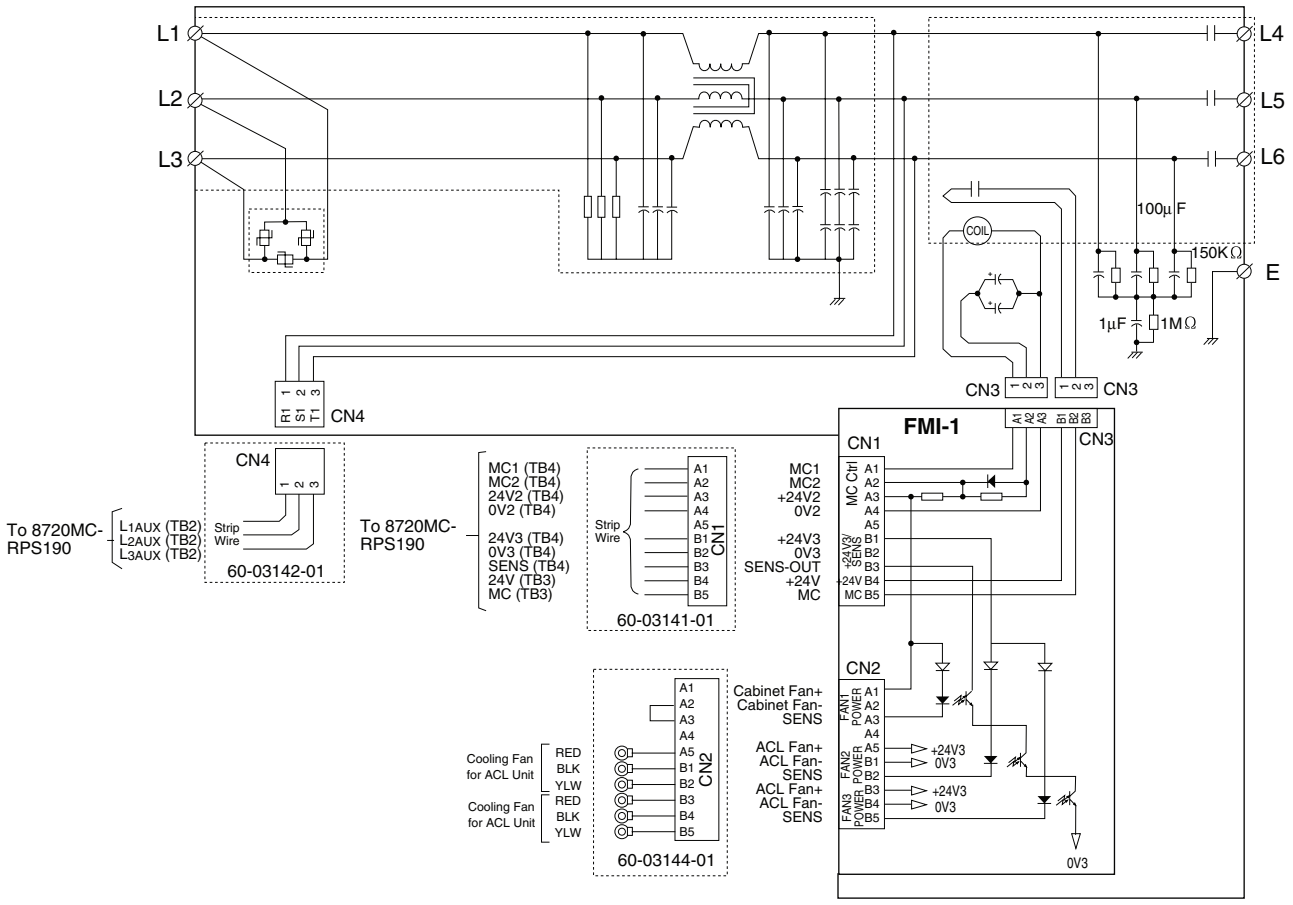


Figure 44 - Connection Diagram of Model 8720MC-EF190-VB EMC Filter Unit



Note: The CN1, CN2, and CN4 connectors/cables are included with the 8720MC-EF190-VB EMC Filter Unit.

CN Connector/Cable Descriptions

Figure 45 - CN1 Description

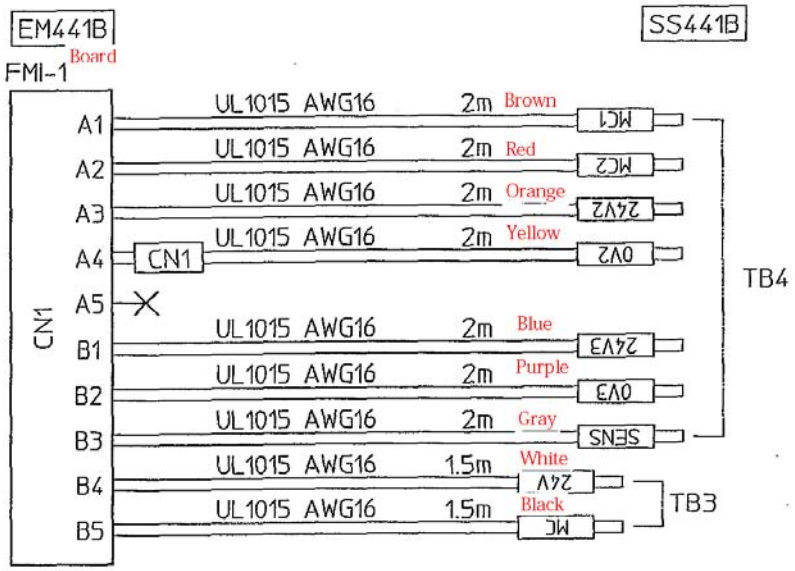


Figure 46 - CN2 Description

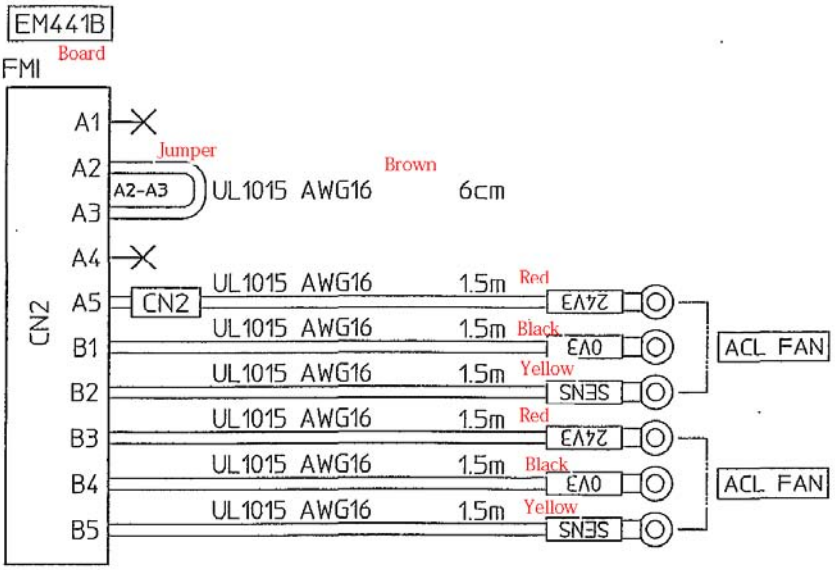
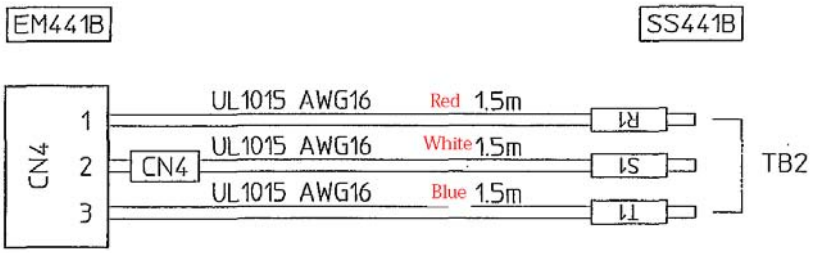


Figure 47 - CN4 Description



Power and Control Terminal Comparison

1336 REGEN Line Regeneration Package

Input Power Conditioning

In general, 1336 REGEN equipment is suitable for direct connection to a correct-voltage AC line. If the AC input power system does not have a neutral or one phase referenced to ground, as detailed under Ungrounded Distribution Systems (as described in the 1336 REGEN Line Regeneration Package User Manual, publication 1336 REGEN-5.0), an isolation transformer with the neutral of the secondary grounded is highly recommended. If the line-to-ground voltages on any phase exceed 125% of the nominal line-to-line voltage, an isolation transformer with the neutral of the secondary grounded is highly recommended.

ATTENTION: The National Codes and standards (NEC, CENELEC, etc.) and local codes outline the provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, branch circuit protection and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

Grounding

All 1336 REGEN components must be connected to system ground at the PE power ground terminal provided. Ground impedance must conform to the requirements of national and local industrial safety regulations (NEC, VDE 0160, BSI, etc.), and should be inspected and tested at appropriate intervals. In any cabinet, use a single low-impedance ground point or ground bus bar. Ground all circuits independently and directly. Also, connect the AC supply ground conductor directly to the ground point or ground bus bar.

Sensitive Circuits

It is essential to define paths through which high frequency ground currents flow to ensure that sensitive circuits do not share a path with these currents. Do not run control and signal conductors near or parallel to power conductors.

TE (True Earth) Termination

The converter's TE terminals are used for all control signal shields internal to the 1336 REGEN Converter and must be connected to the converter's TE terminals by a separate continuous lead.

PE (Power Earth) Termination

A safety ground is required by code. This point must be connected to adjacent building steel or a floor ground rod provided grounding points comply with NEC and local regulations.

Figure 48 - 1336 REGEN Grounding for Common Bus Drive

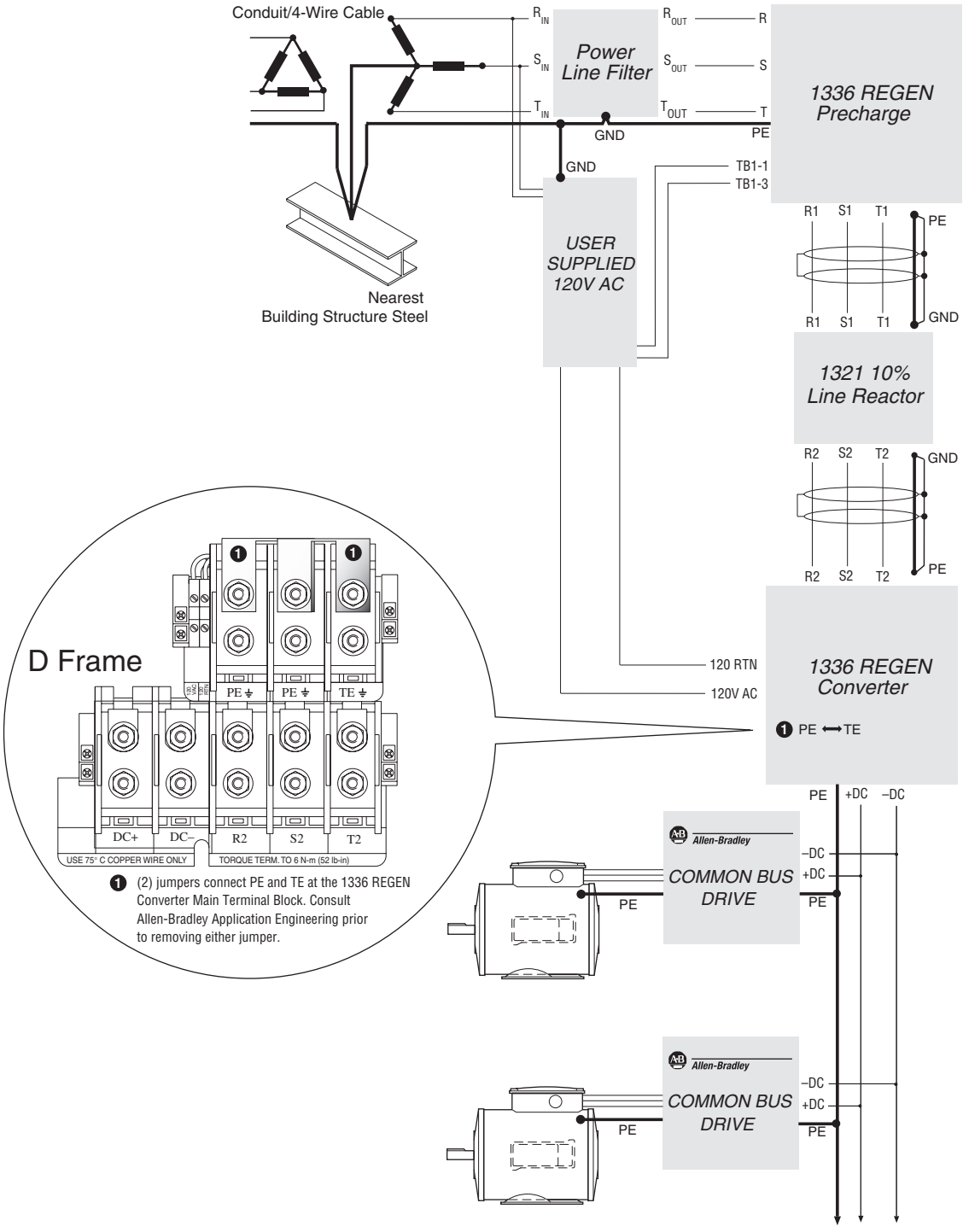
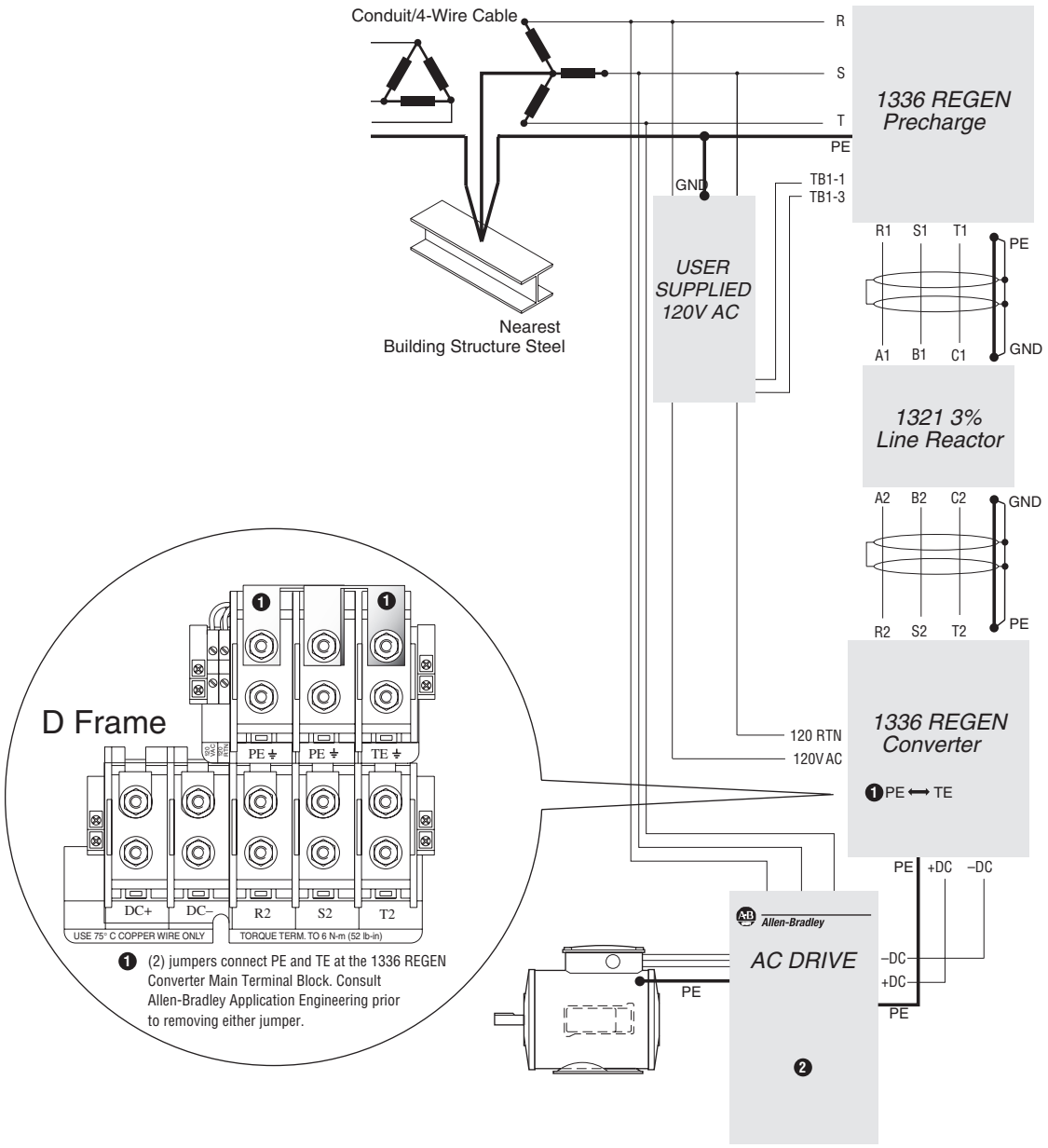


Figure 49 - 1336 REGEN Grounding for AC Drive



❷ Important: If you are using a Regenerative Brake with a B Frame AC drive, refer to the Power-up Sequence on page 3-3.

380...480VAC Power Connections

380...480VAC input and output power connections are made as shown in Figure 50 through Figure 54.

ATTENTION: 1336 REGEN equipment will not be properly synchronized unless correct Filter-to- Precharge-to-Line Reactor-to- Converter AC power connections are maintained. Failure to maintain correct phase-related connections will result in equipment malfunction and/or failure.

Table 18 - 380...480VAC Power Connections

	Line Filter		Precharge Unit		Line Reactor		Converter
	Input Term.	Output Term.	Input Term.	Output Term.	Input Term.	Output Term.	Input Term.
Regenerative DC Bus Supply Operation	R_{IN}	R_{OUT}	R	R1	R1	R2	R2
	S_{IN}	S_{OUT}	S	S1	S1	S2	S2
	T_{IN}	T_{OUT}	T	T1	T1	T2	T2
Regenerative Brake Operation			R	R1	A1	A2	R2
			S	S1	B1	B2	S2
			T	T1	C1	C2	T2

Note: Between the Regenerative DC Bus Supply Operation and Regenerative Brake Operation system layouts, the power wiring connection paths are identical in principle. The only exceptions are that the Regenerative DC Bus Supply has to have an additional Power Line Filter component and the symbol nomenclatures for the Line Reactors between the two operations are called out differently.

Figure 50 - 380...480VAC Power Line Filter Connections

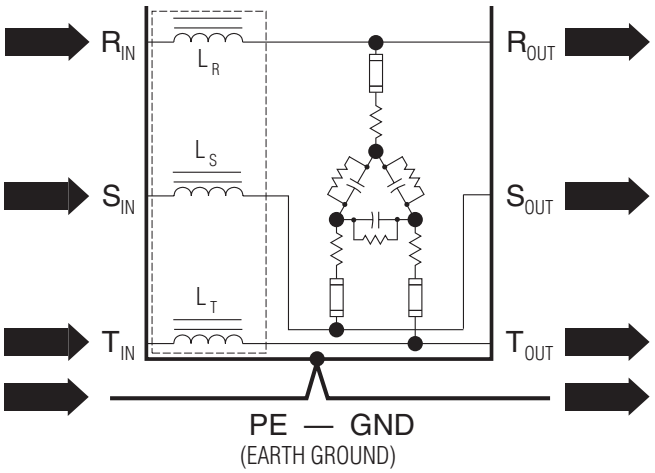
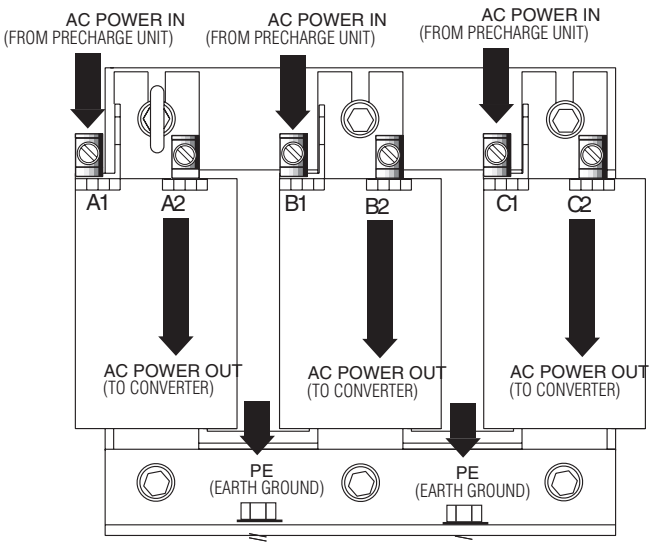
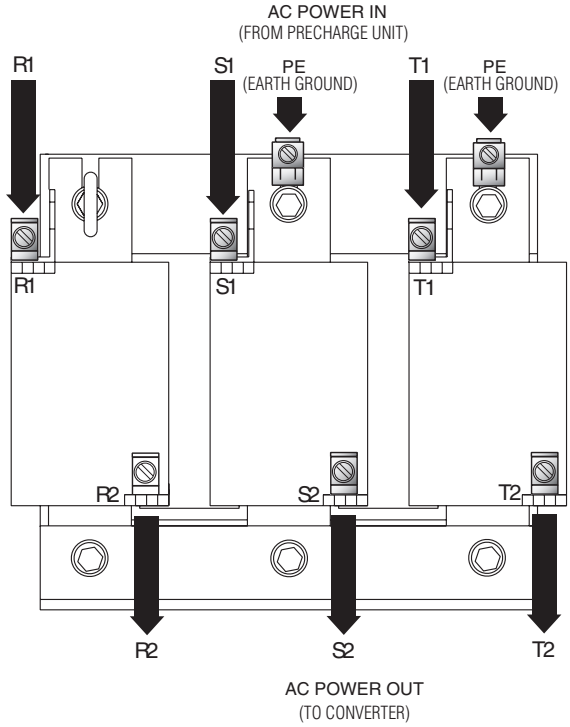


Figure 51 - 380...480VAC 1321 Line Reactor Connections

1321 3% Line Reactor



1321 10% Line Reactor



380...480VAC Power Wiring

Figure 52 - 380...480VAC Precharge Unit Connections

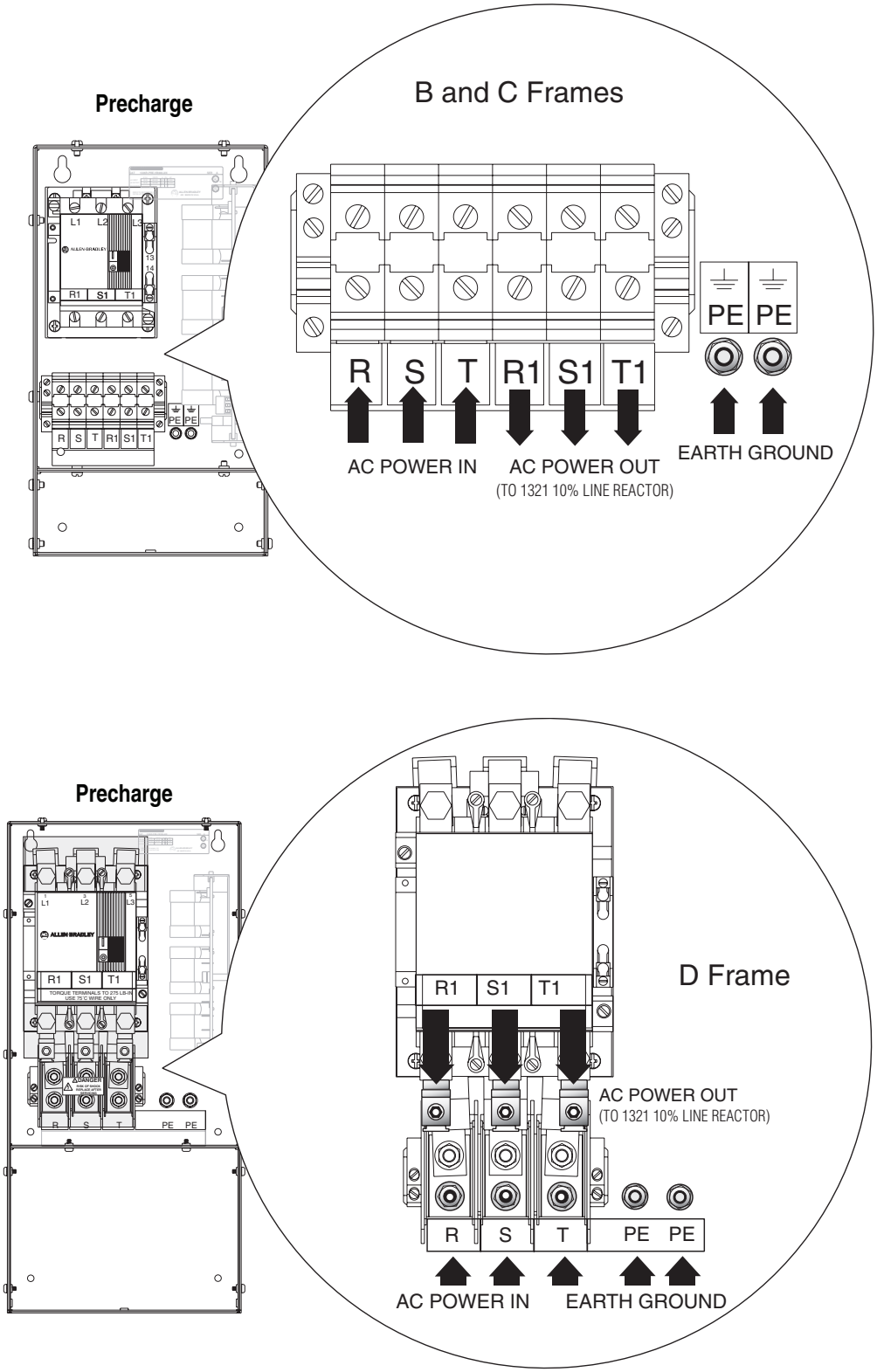


Figure 53 - B and C Frame 380...480VAC Converter Connections

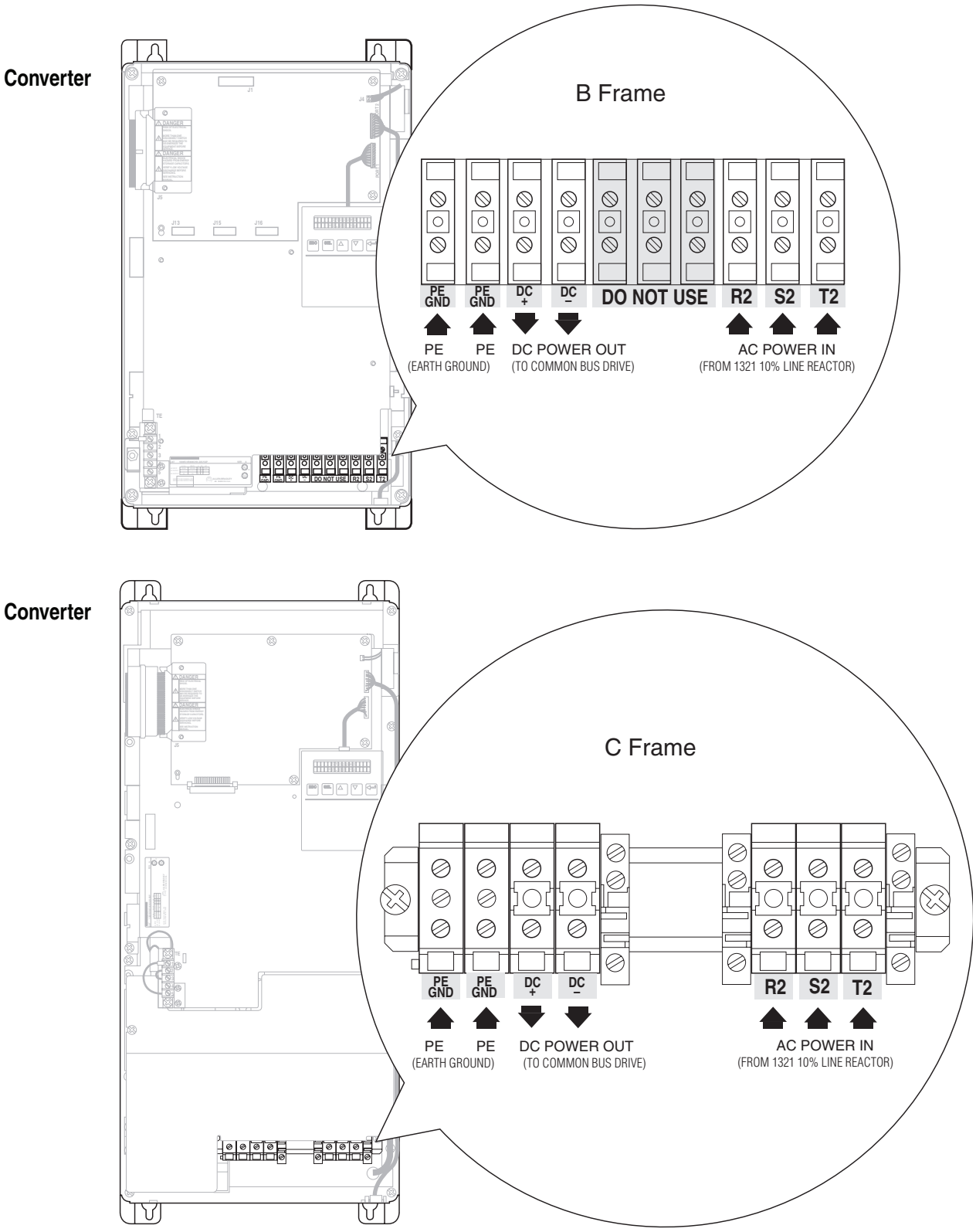
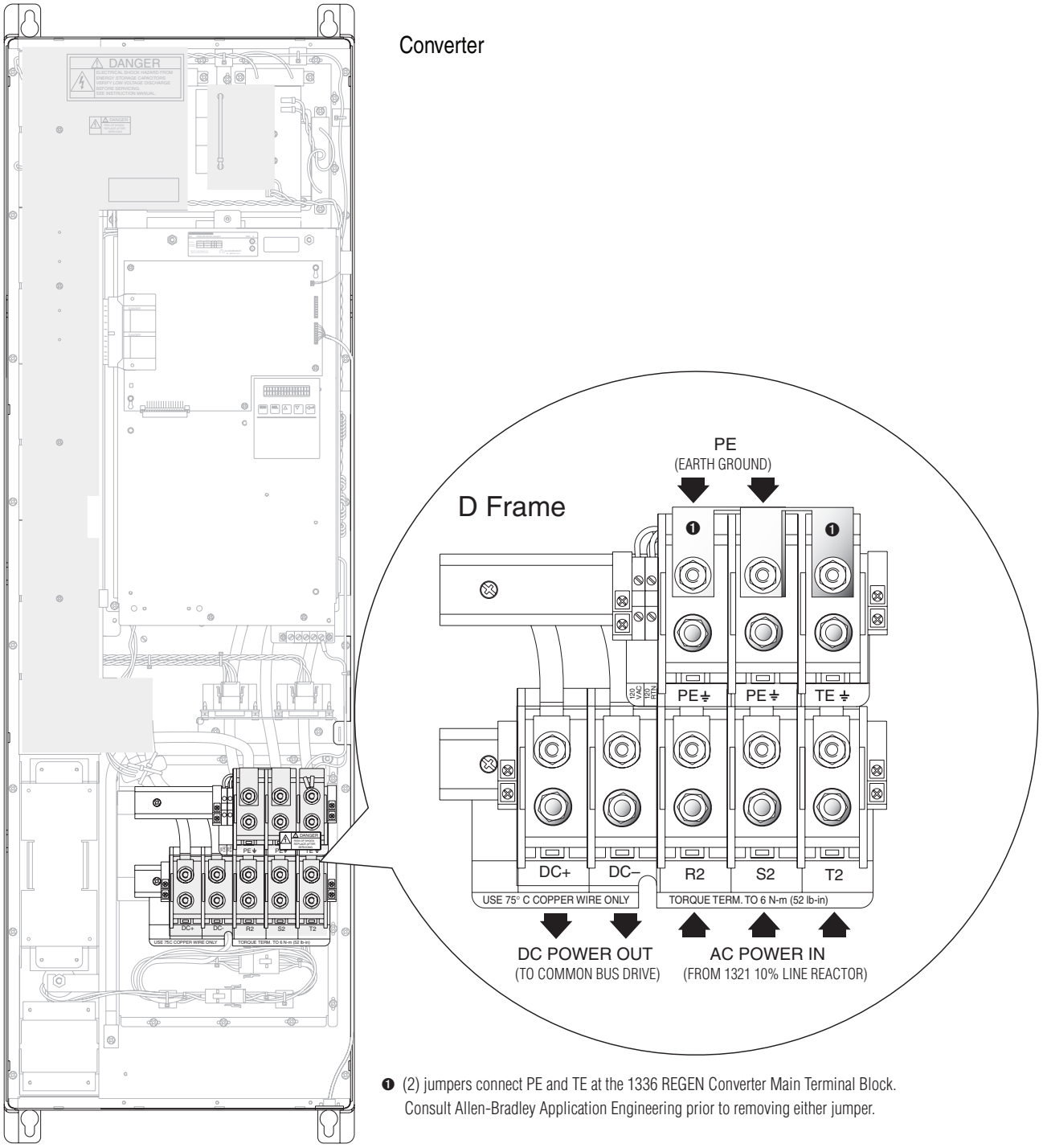


Figure 54 - D Frame 380...480VAC Converter Connections



❶ (2) jumpers connect PE and TE at the 1336 REGEN Converter Main Terminal Block. Consult Allen-Bradley Application Engineering prior to removing either jumper.

380...480VAC Power Connection Specifications

Use 75 °C (167 °F) Copper Wire Only.

Table 19 - 380...480VAC Power Connection Specifications

1336 REGEN Power Line Filter Ratings	Max/Min Wire Size mm^2 (AWG) (1)	Max Torque N•m (lb•in)
48A	13.3/0.5 (6/20) —Single Conductor	1.70 (15)
78A	26.7/0.8 (3/18) — Single Conductor	5.65 (50)
180A	127.0/2.1 (250MCM/14) — Single Conductor 67.4/2.1 (00/14) — Double Conductor	6.00 (52)
1336 REGEN Precharge Unit Ratings		
B Frame	13.3/0.5 (6/20) — Single Conductor	1.70 (15)
C Frame	26.7/0.8 (3/18) — Single Conductor	5.65 (50)
D Frame	127.0/2.1 (250MCM/14) — Single Conductor 67.4/2.1 (00/14) — Double Conductor	6.00 (52)
1321 10% and 3% Line Reactor Cat. No.		
-3LR048-B and -3LRA048-B (10%) -3R55-B and -3RA55-B (3%)	13.3/0.5 (6/20) — Single Conductor	1.70 (15)
-3LR078-B and -3LRA078-B (10%) -3R100-B and -3RA100-B (3%)	26.7/0.8 (3/18) — Single Conductor	5.65 (50)
-3LR180-B and -3LRA180-B (10%) -3R200-B and -3RA200-B (3%)	127.0/2.1 (250MCM/14) — Single Conductor 67.4/2.1 (00/14) — Double Conductor	6.00 (52)
1336 REGEN Converter Ratings		
B Frame	13.3/0.5 (6/20) — Single Conductor	1.70 (15)
C Frame	26.7/0.8 (3/18) — Single Conductor	5.65 (50)
D Frame	127.0/2.1 (250MCM/14) — Single Conductor 67.4/2.1 (00/14) — Double Conductor	6.00 (52)

(1) Listed wires sizes are maximum/minimum wire sizes that the terminals will accept — they are not recommendations.

Input power connections to D frame Precharge Units and input/output power connections to D frame Converters are stud type terminations or bus bar bolts that require the use of lug-type connectors to terminate field-installed conductors. Lugs used with these connections are listed in Table 20.

Table 20 - Frame D I/O Power Connections

Catalog Number	Precharge Input R, S, T & PE Converter Input R2, S2, T2 & PE Converter Output DC+ & DC–	T & B Part Number(1)
1336R-VB180	Cable (per phase) Qty. = 1 mm^2 = 107.2 AWG = 4/0	Qty. = 10 P/N = 54168(2)

(1) T & B COLOR-KEYED® Connectors require T & B WT117 or TBM-6 Crimper tool or equivalent. Lugs should be crimped according to manufacturer's tool instructions.
(2) 5/16" stud. All other termination studs are 3/8".

120VAC Precharge and Converter Wiring

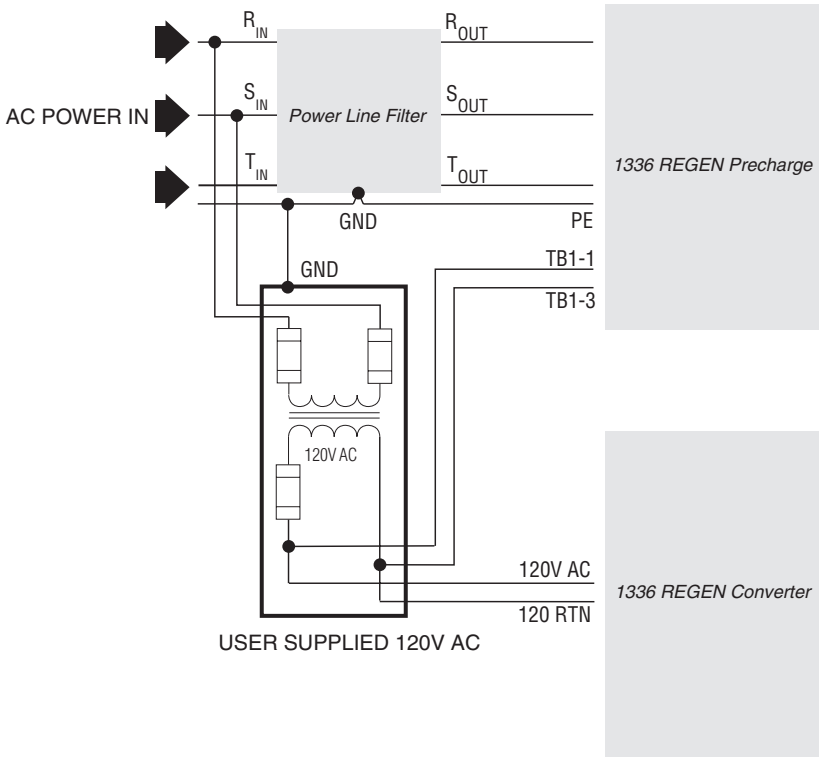
ATTENTION: 1336 REGEN equipment does not provide 120VAC short circuit fusing. Branch circuit breakers or disconnect switches cannot provide this level of protection for converter and precharge unit components. Short circuit fusing should be sized and typed in accordance with National Codes and standards (NEC, CENELEC, etc.) and any additional local codes.

Table 21 - 120VAC Current Requirements

1336 REGEN LINE REGENERATION PACKAGE CAT. NO.	PRECHARGE CONTACTOR		CONVERTER FAN	
	Inrush Amps	S.S. Amps	Inrush Amps	S.S. Amps
1336R-VB048 1336R-VB078	3A	0.3A	—	—
1336R-VB180	7A	0.7A	5A	0.8A

120VAC is required by the 1336 REGEN Precharge Contactor and 1336 REGEN D Frame Converter fan. 120VAC must be derived from the same AC power supply source used for all 1336 REGEN equipment and taken at the AC Power Input, or before the Power Line Filter, if used.

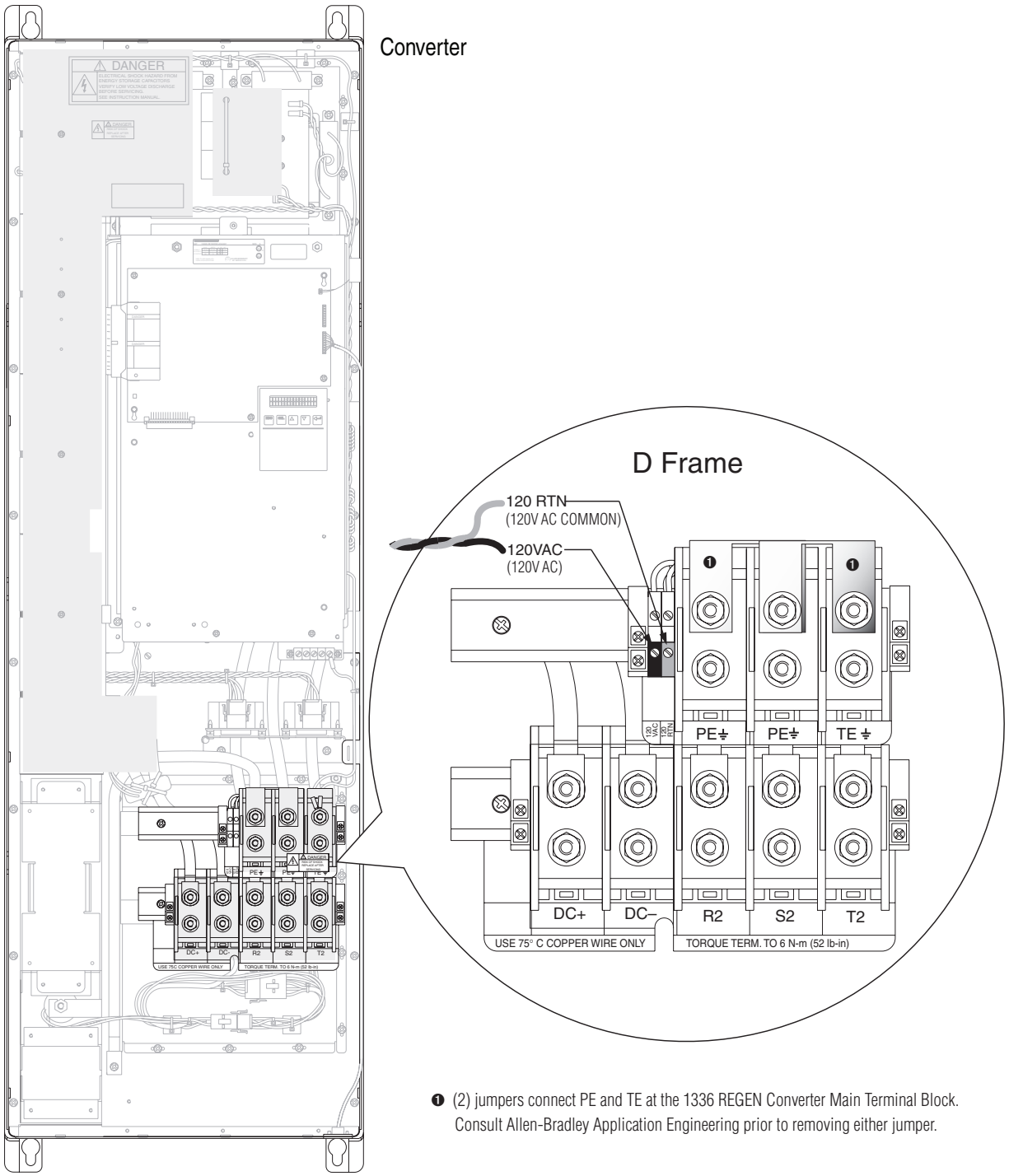
Figure 55 - 120VAC Precharge and Converter Connections



120VAC Converter Connections

120VAC input and output power connections are made to D Frame Converters as shown in Figure 56.

Figure 56 - 120VAC D Frame Converter Connections

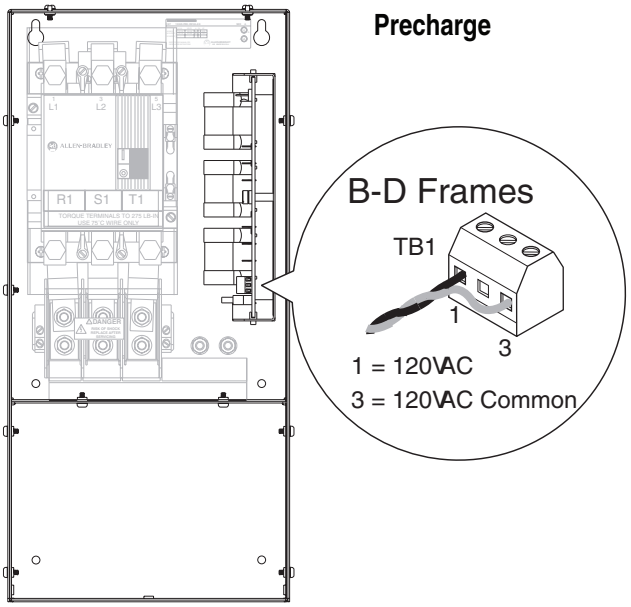


❶ (2) jumpers connect PE and TE at the 1336 REGEN Converter Main Terminal Block. Consult Allen-Bradley Application Engineering prior to removing either jumper.

120VAC Precharge Connections

120VAC input and output connections are made to B...D Frame Precharge Units as shown in Figure 57.

Figure 57 - 120VAC Precharge Unit Connections



120VAC Connection Specifications

Use 75 °C (167 °F) Copper Wire Only.

Table 22 - 120VAC Connection Specifications

1336 REGEN PRECHARGE UNIT RATING	Max/Min Wire Size mm^2 (AWG)(1)	Max Torque N•m (lb•in)
B...D Frames	2.1/0.30 (14/22)	0.90-1.13 (8-10)
1336 REGEN CONVERTER RATING		
D Frame	2.1/0.30 (14/22)	0.90-1.13 (8-10)

(1) Listed wires sizes are maximum/minimum wire sizes that the terminals will accept — they are not recommendations.

Control and Signal Wiring

Sync Cable

The sync cable that is shipped with the 1336 REGEN Precharge unit connects the required startup, diagnostic, and control signals between the 1336 REGEN Converter Control Board and the 1336 REGEN Precharge Board. The ribbon cable shield provided at the converter end must be connected to the Control Board Shield Connector J14 as shown in Figure 60 to maintain signal integrity.

IMPORTANT The Precharge-to-Converter Sync Cable shipped with the 1336 REGEN Precharge Unit must be connected between the Precharge Board in the Precharge Unit and the Control Board in the 1336R Converter for 1336 REGEN Line Regen Package operation.

Figure 58 - 1336 REGEN Precharge-to-Converter Sync Cable Installation

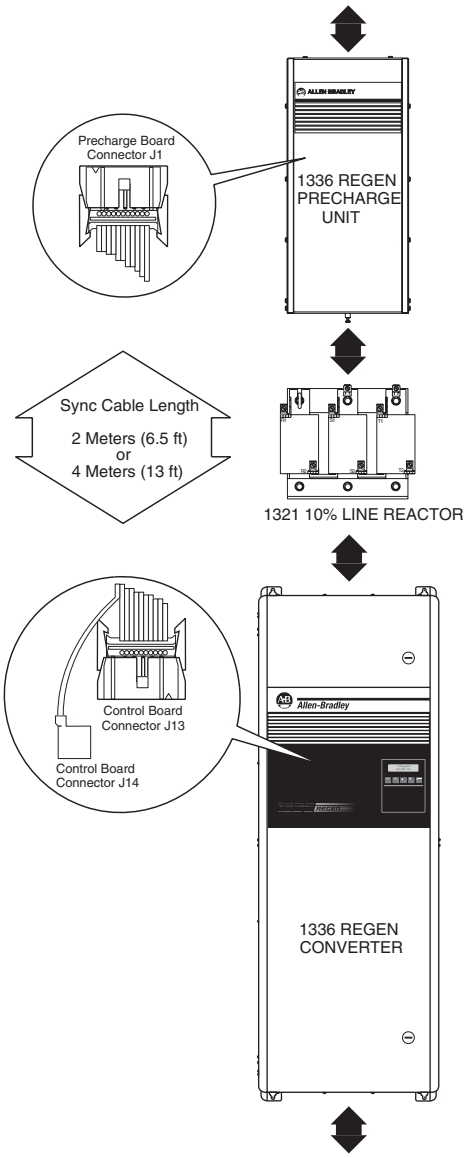


Figure 59 - Precharge Unit Precharge Board Connections

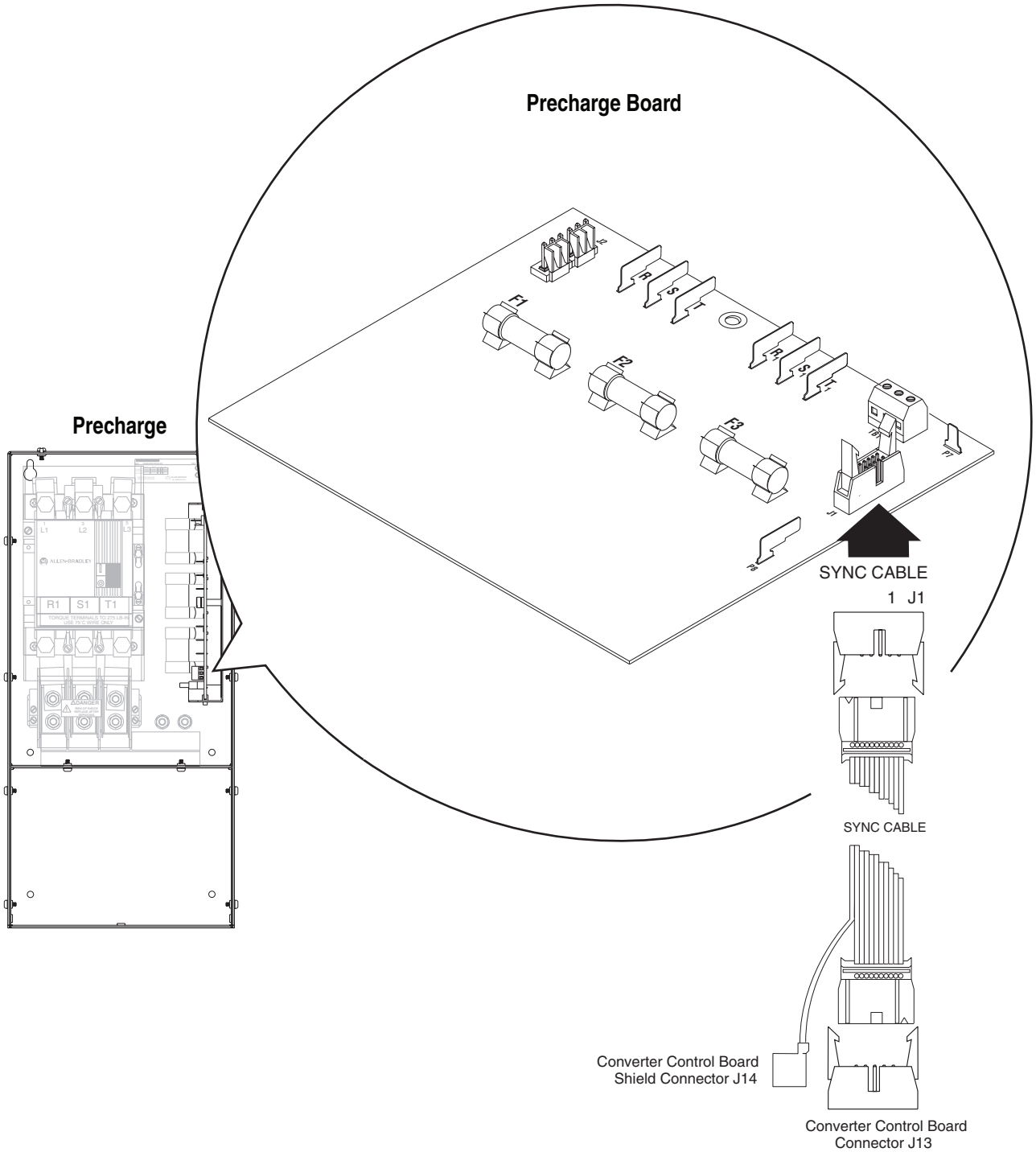
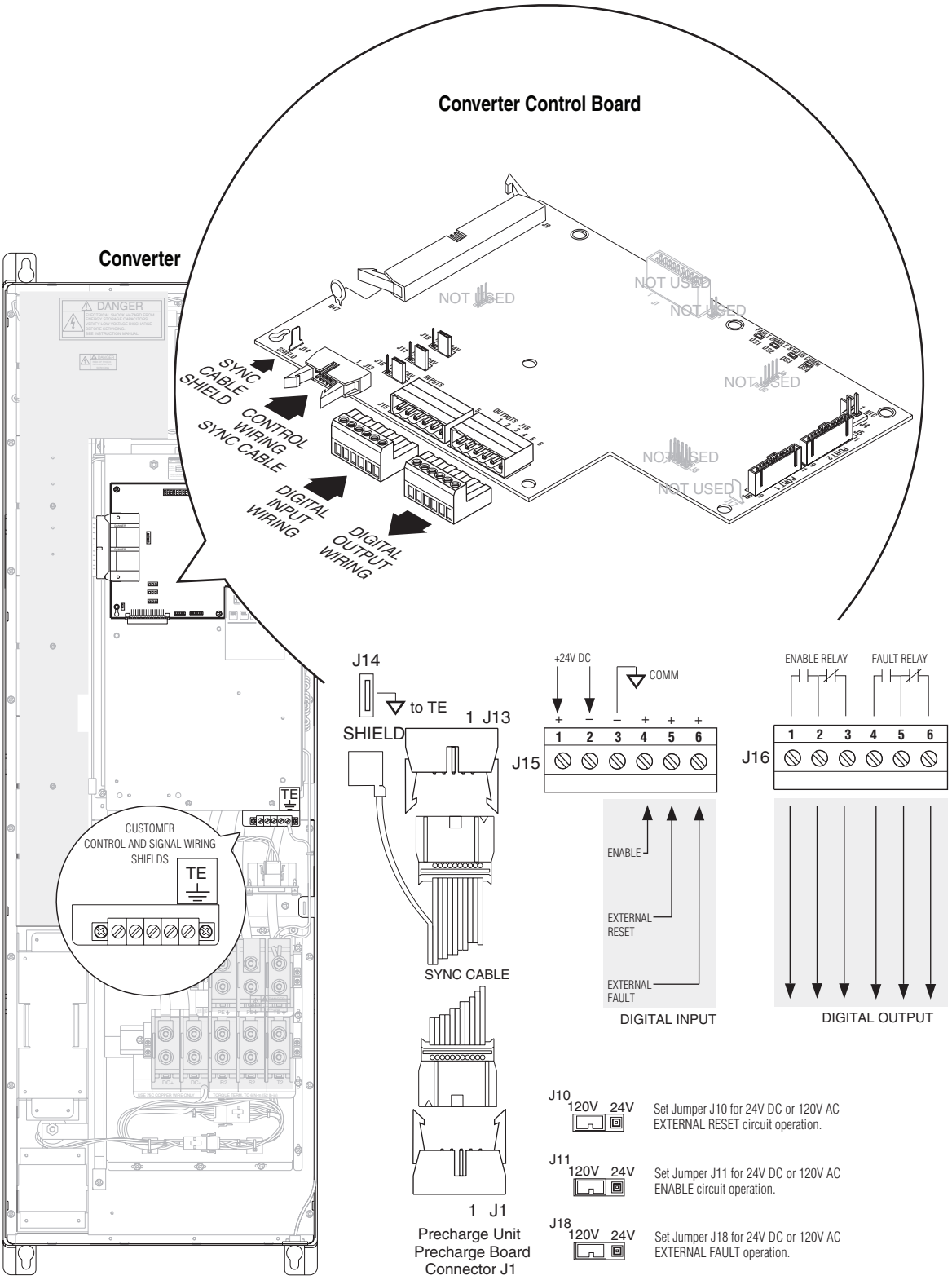


Figure 60 - Converter Control Board Connections



Control Board Connections

All customer control and signal wiring is made to quick-connect terminal blocks J15 and J16.

The maximum/minimum wire sizes accepted by J15 and J16 is 3.3/0.6mm^2 (12/30AWG). Maximum torque is 0.79N•m (7lb•in). Recommended control/signal wire is:

- Belden® 8760 (or equivalent) — 0.750mm^2 (18AWG), Twisted Pair, Shielded.
- Belden 8770 (or equivalent) — 0.750mm^2 (18AWG), Three-conductor, Shielded.
- Belden 9460 (or equivalent) — 0.750mm^2 (18AWG), Twisted Pair, Shielded.

Note: If the converter control connections are to be linked to an electronic circuit or device, the common or 0V line should be grounded at the drive end only.

IMPORTANT	Signal common (DGND) puts the common or negative side of the signal at earth ground potential. Control schemes must be examined for possible conflicts.

All customer control and signal wiring shields are terminated at the TE terminal block shown in Figure 60.

Cable Routing

If unshielded cable is used, control and signal circuits should not run parallel to motor, DC bus, or unfiltered supply cables with a spacing less than 0.3 m (1 ft). Cable tray metal dividers or separate conduit should be used.

IMPORTANT	If user-installed control and signal wiring with an insulation rating of less than 600V is used, route the wiring inside the converter enclosure such that is it separate from any other wiring or uninsulated live parts.

Digital Input Signals

ATTENTION: Ensure that all jumpers on the 1336 REGEN Converter Control Board are set correctly prior to applying AC power to the board. Applying 120VAC to the digital inputs when jumpers J10, J11, or J18 are set to 24VDC will permanently damage the Converter Control Board.

IMPORTANT Customer EXTERNAL FAULT and ENABLE circuits must be connected to J15 and at logic high for the 1336 REGEN Converter to operate.

1336 REGEN Converter digital inputs are designed for operation at either 24VDC or 120VAC. Digital input signal circuits must be capable of operating with high = true logic.

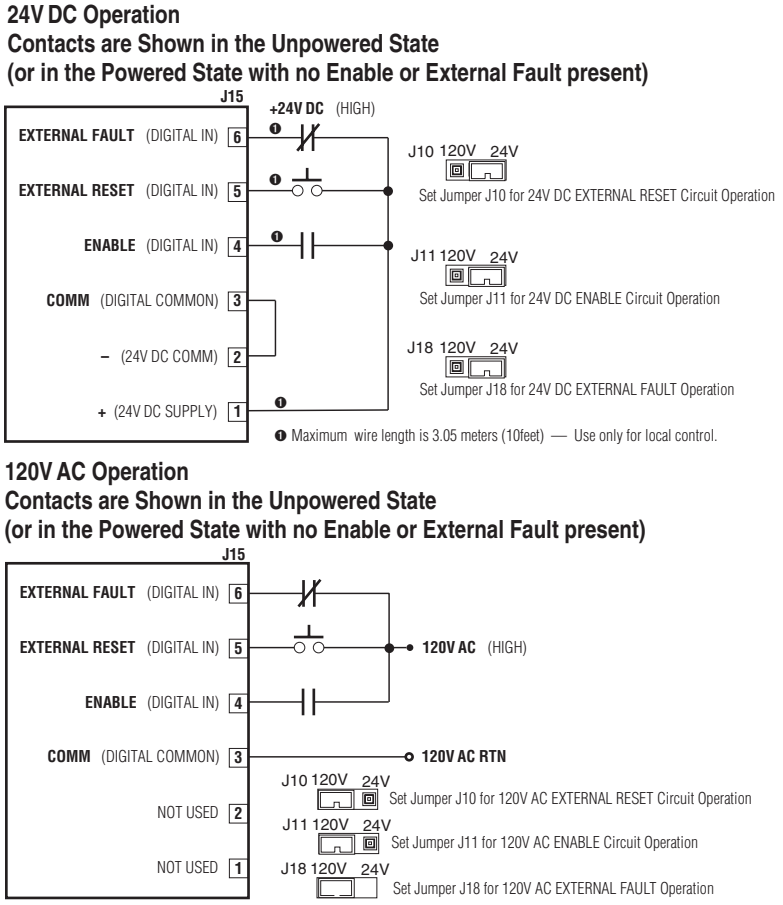
- **For 24VDC operation**, +24VDC is available from the 1336 REGEN Converter Control Board.
- **For 120VAC operation**, a separate 120VAC user supply is required.

Table 23 - 24VDC and 120VAC Circuits

IN THE LOW STATE . . .	MUST GENERATE A VOLTAGE OF NO MORE THAN . . .	AND LEAKAGE CURRENT MUST BE LESS THAN . . .
24VDC Circuits	8VDC	1.5mA Into a 2.5kW Load
120VAC Circuits	30VAC	10mA Into a 6.5kW Load

IN THE HIGH STATE . . .	MUST GENERATE A VOLTAGE OF . . .	AND SOURCE CURRENT MUST BE AT LEAST . . .
24VDC Circuits	20...26VDC	10mA
120VAC Circuits	81...132VAC	20mA

Figure 61 - 24VDC and 120VAC Circuits Operation



IMPORTANT Fuse R47 is self-resetting and will open should a low impedance or short circuit occur at J15 during 24VDC operation. Should a fault occur, allow 1 minute after removal of power from the Converter Control Board for R47 to cool before reapplying power.

IMPORTANT For Regenerative DC Bus Supply applications, the 1336 REGEN Line Regeneration Package will be used with one or more common bus drives. It is recommend that the fault relay on the 1336 REGEN Converter Control board be interconnected into the common bus drive(s) control logic. This will allow coordination the Regenerative DC Bus Supply faults with the common bus drive.

External Fault

Allows a customer-supplied external signal to be wired into the 1336 REGEN Converter. Opening this contact issues an external fault command, disabling the converter.

External Reset

Resets the 1336 REGEN Converter when closed. If the converter has faulted, closing this contact clears the fault and resets the converter.

Enable

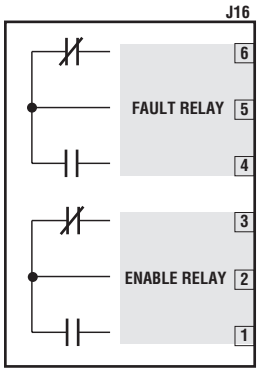
For the 1336 REGEN Converter to modulate, an enable signal must be present at J15 on the 1336 REGEN Converter Control Board. Opening this contact disables the converter. When this contact is closed, the Enable LED on the Control Board will be lit.

Digital Output Signals

Two form C, N.O./N.C. output relays are available at J16 on the 1336 REGEN Control Board to provide external warning or fault change-of-state signals.

- Resistive Rating = 120VAC/30VDC, 5.0A
- Inductive Rating = 120VAC/30VDC, 2.0A

Figure 62 - Contacts Shown in the Unpowered State



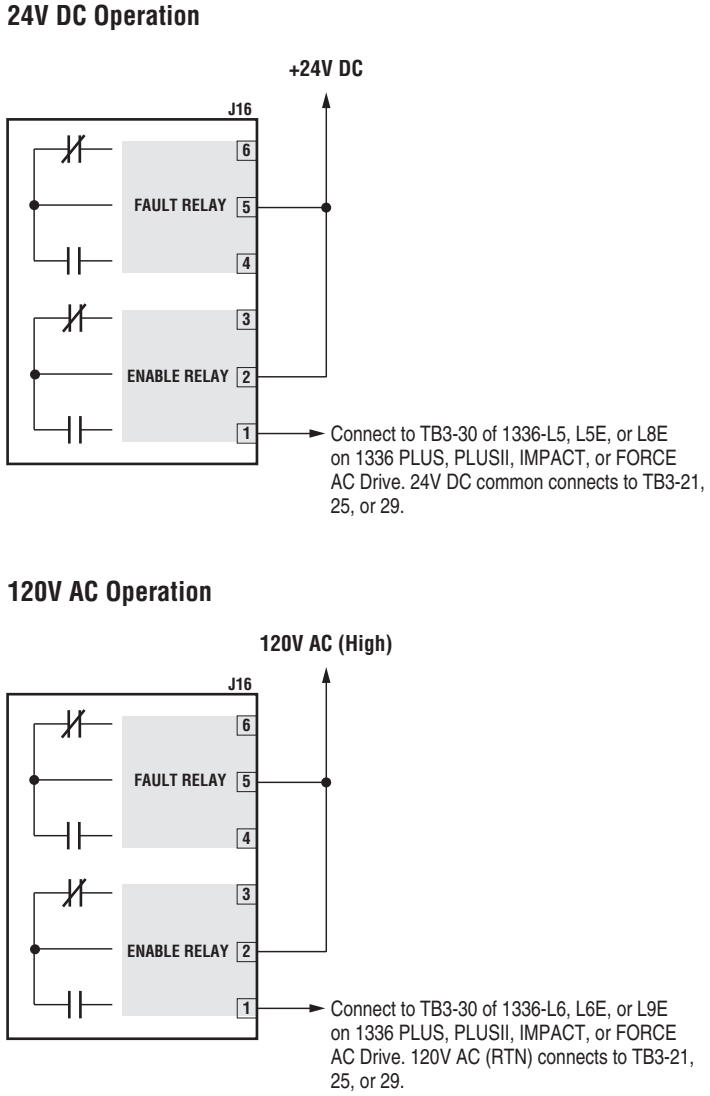
Fault Output - The fault output is used to indicate that the 1336 REGEN Converter is faulted with either an internal or external fault.
Note: The unpowered state of the fault relay is the opposite of the faulted state—or the unpowered state of the fault relay indicates an unfaulted condition.

Enable Output - The enable output indicates that the 1336 REGEN Converter is modulating. An enable signal must be present on J15 and the 1336 REGEN Converter must not be faulted for the enable output to be active.

Interlocking 1336 REGEN Enable with AC Drive Enable

It may be desirable to interlock the 1336 REGEN Enable Output with the Enable Input on the connected 1336 PLUS, 1336 PLUSII, 1336 IMPACT, or 1336 FORCE AC drive. This will keep the AC drive from starting if the 1336 REGEN Converter is not enabled, and will also remove the Enable signal from the AC drive if the 1336 REGEN Converter is faulted. If the Enable signals are not interlocked, the AC drive may fault on bus overvoltage when attempting to regenerate.

Figure 63 - Interlocking 1336 REGEN Enable with AC Drive Enable



1336 REGEN (Enable)

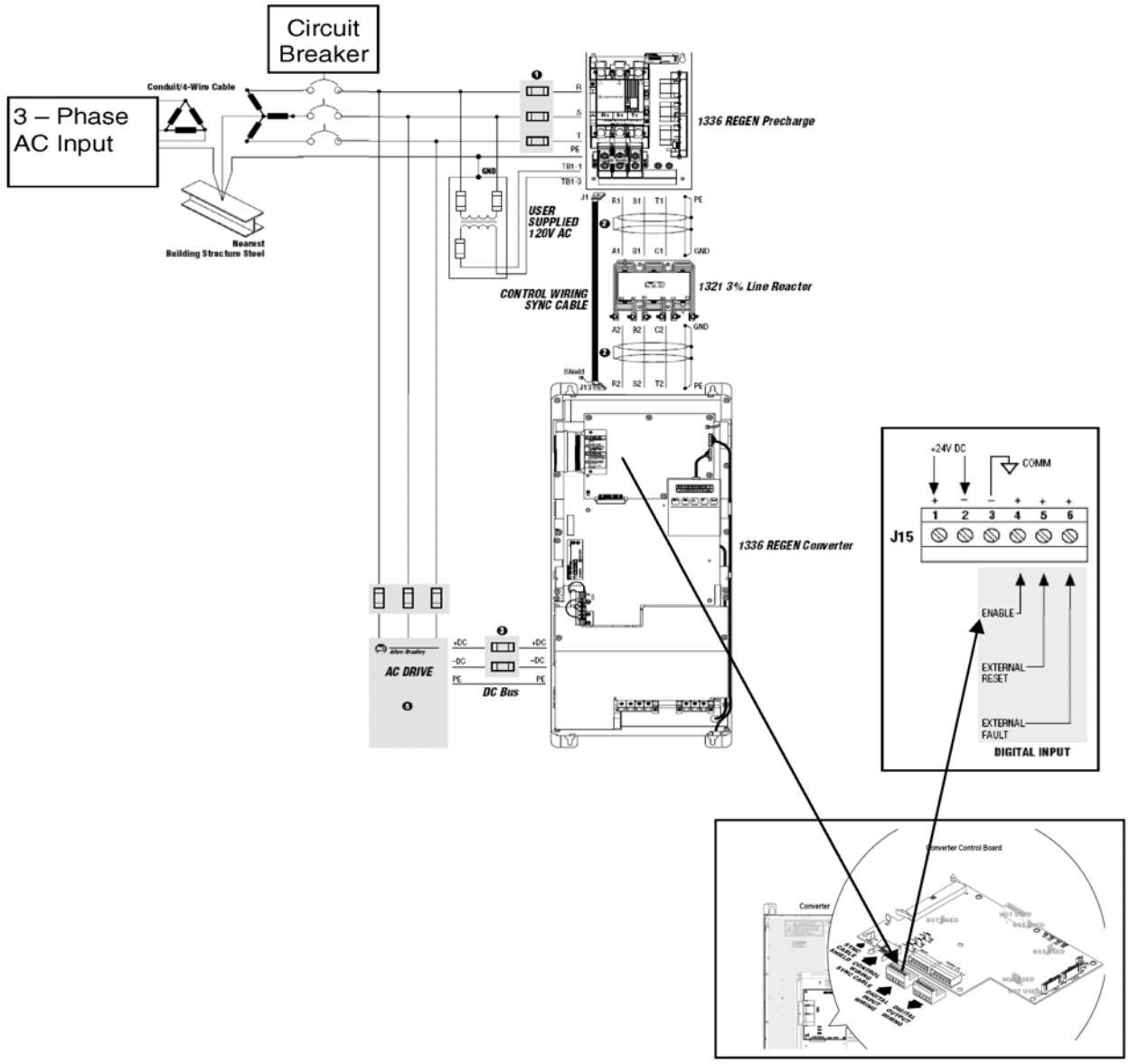
Power Down

The Enable on the Regen Unit should be open whenever the main three-phase AC power to the Regen Unit is removed.

Power Up

The Enable on the Regen Unit Should be open whenever the three-phase AC line is just powering up/going through precharge (DC bus is below 85% of the nominal DC bus voltage). Once all the drives and the Regen Unit are at nominal DC bus level, then the Enable can be closed.

Figure 64 - 1336 REGEN (Enable), Power Up/Power Down



Converter Control Board
(see Figure 60 for details)

8720MC-RPS Regenerative Power Supply

Installing DC Bus Power Output Wiring - All RPS units

ATTENTION: When connecting the DC bus to plural number of external load equipment, the user is responsible for installing fuses to protect the DC bus from shorting, if no fuse is provided in the load equipment. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

ATTENTION: Exercise extreme caution for polarity of wiring when wiring DC bus. Failure to observe this precaution could result in damage to, or destruction of, the 8720MC-RPS Regenerative Power Supply and the connected load equipment.

The DC bus output terminals on the main power terminal block (TB1) or the DC bus terminal bars of the 8720MC-RPS Regenerative Power Supply are used for connecting to load equipment such as an inverter. Use the recommended wire size shown in Table 31 on page 93 and Table 32 on page 93 for wiring between the 8720MC-RPS Regenerative Power Supply and the load equipment. Connect the terminal P on the main power terminal block (TB1) or the terminal bar P of the 8720MC-RPS Regenerative Power Supply to the positive (plus) DC bus terminal of the load equipment, and the terminal N on the terminal block TB1 or the terminal bar N to the negative (minus) DC bus terminal of the load equipment. Do not connect the positive (plus) side with the wiring of the negative (minus) side. Such miswiring will damage the 8720MC-RPS Regenerative Power Supply and the connected load equipment.

When multiple drives are connected to the 8720MC-RPS Regenerative Power Supply, we suggest you install input fuses before each drive (or refer to local code) to protect the wiring and the drive. Select adequate fuse(s) for the drives.

Grounding the 8720MC-RPS Regenerative Power Supply

Connect an adequate equipment grounding conductor to ground terminal of load equipment, remote control station (if used), input transformer (if used), and ground terminal of the 8720MC-RPS Regenerative Power Supply. Run earth conductor to earth ground after confirming that the conductors are unbroken.

This system is operated by switching DC bus line from + (plus) bus voltage to - (minus) bus voltage viewing from the ground for the purpose of controlling. For this reason, plus and minus voltages are always added on a circuit if equipment has a circuit between the bus line of equipment to be connected and the ground (earth). Even if no direct circuit exists between the bus line and the ground, pulse current will flow through the stray capacity of the equipment by bus voltage switching. When 8720MC-RPS and equipment to be connected to 8720MC-RPS are not securely grounded, this current will flow through the circuit and may cause malfunction of them. If grounding is not made properly, it will cause the malfunction of the other system on the same line.

Install an insulating transformer to the input line of the 8720MC-RPS if unbalanced current flows and earth leakage breaker malfunctions due to the power supply conditions.

For grounding, use the wire size of grounding terminal as shown in Table 31 on page 93 and Table 32 on page 93

Wiring To Comply with Electromagnetic Compatibility (EMC)

To declare conformity with the requirements for CE Mark, 8720MC-RPS Regenerative Power Supply must comply with both EMC directive and low voltage directive. This section describes notes on wiring to comply with EMC directive.

IMPORTANT 8720MC-RPS Regenerative Power Supply itself is not subject to Machine directive. When 8720MC-RPS Regenerative Power Supply is combined with other equipment, control cabinet and machine, it is needed to declare the compliance with Machine directive. Noise level will vary depending on the installation and wiring of 8720MC-RPS Regenerative Power Supply, other equipment and control cabinet. It has been already confirmed that 8720MC-RPS Regenerative Power Supply complies with EMC standards only when 8720MC-RPS Regenerative Power Supply is composed of the component parts designated by Reliance Electric. In order for users to declare the conformity with the requirements for CE Mark, do not fail to confirm that the unit complies with EMC standards on the final conditions after completion of installation and wiring.

Table 24 shows the EMC standards compliance for the 8720MC-RPS Regenerative Power Supply units.

Table 24 - 8720MC-RPS EMC Standards

8720MC-RPS027	**(This model is no longer available.)**
8720MC-RPS065	2004/108/EC EN 50178:1997 EN 61800-3:2004
8720MC-RPS190	

Follow these guidelines for wiring to reduce the possibility of strong noise on the input and output lines of the 8720MC-RPS Regenerative Power Supply.

1. Use a control cabinet made of metal for installing the 8720MC-RPS Regenerative Power Supply (It has been confirmed that this unit complies with EMC standards when installed inside the control cabinet).
2. Install a line filter designated by Reliance Electric to the power input line of the 8720MC-RPS units. Wiring to the line filter must be as short as possible.

3. Because current will leak to the earth when a line filter is installed, connection to the earth must be secured. Due to leaked current, the earth leakage breaker may malfunction. Select a proper breaker complying with leaked current (Rated current 100 to 500mA and operating time within 0.1 to 2 seconds).
4. The control cabinet must be securely grounded. Wiring to be taken into grounding terminal of the control cabinet must be as thick and short as possible.
5. The input and output line of the 8720MC-RPS units must be separated from the output line of the inverter unit as far as possible.
6. Wiring of the control signal must be terminated within the control cabinet. If the control cable needs to extend out of the control cabinet, it is recommended to use shielded cables. When ferrite cores are used, install them to the side of the 8720MC-RPS units. The following are the ferrite cores for the control cables recommended.
   - ZCAT2032-0930 (Inside diameter 9 +/- 1 mm): TDK
   - ZCAT2035-1330 (Inside diameter 13 +/- 1 mm): TDK
7. For notes on wiring to the other equipment and motors to be connected with the 8720MC-RPS, refer to the manuals of the relevant equipment.

Power Rating

Power rating of 8720MC-RPS Regenerative Power Supply depends on the number of units connected in parallel as shown in Table 25. Up to three units can be connected.

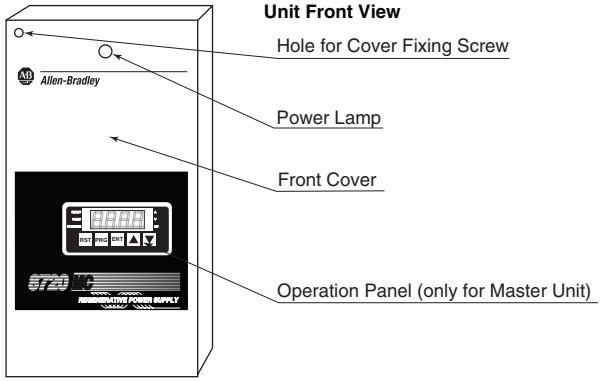
Table 25 - Unit, Connection, and Power Ratings

Unit	Connection	Model Number	Power Rating
15 kW	Single Unit	8720MC-RPS027BM x 1 **(This model is no longer available.)**	15 kW
37 kW	Single Unit	8720MC-RPS065BM x 1	37 kW
	Two paralleled units	8720MC-RPS065BM + 8720MC-RPS065BS x 1	75 kW
	Three paralleled units	8720MC-RPS065BM + 8720MC-RPS065BS x 2	110 kW
125 kW	Single Unit	8720MC-RPS190BM x 1	125 kW
	Two paralleled units	8720MC-RPS190BM + 8720MC-RPS190BS x 1	250 kW
	Three paralleled units	8720MC-RPS190BM + 8720MC-RPS190BS x 2	375 kW

Appearance of Model 8720MC-RPS065

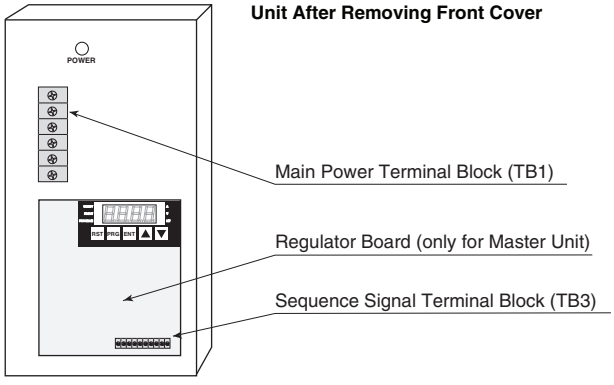
Figure 65 shows the front view of the 8720MC-RPS065 with the front cover installed. The operation panel (only for master unit) and the power lamp can be seen through the front cover. All the terminals blocks to connect wiring are covered by the front cover.

Figure 65 - Front View of the 8720MC-RPS065 With Cover



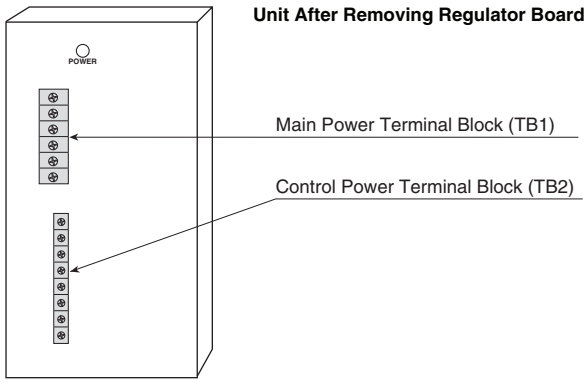
When the front cover is removed from the 8720MC-RPS065, the main power terminal block (TB1) and the Regulator Board (only for master unit) appear as shown in Figure 66. To remove the front cover, first remove the screw at the upper-left corner of the unit, and then lift up the cover. Do not drop the screw from the cover.

Figure 66 - Front View of the 8720MC-RPS065 With Cover Removed



The control power terminal block (TB2) for Model 8720MC-RPS065 is disclosed as shown in Figure 67 when the Regulator Board is opened to the left-hand side by removing the two fixing screws on the right-hand side of the bracket supporting the Regulator Board.

Figure 67 - Front View of the 8720MC-RPS065 With Regulator Board Removed

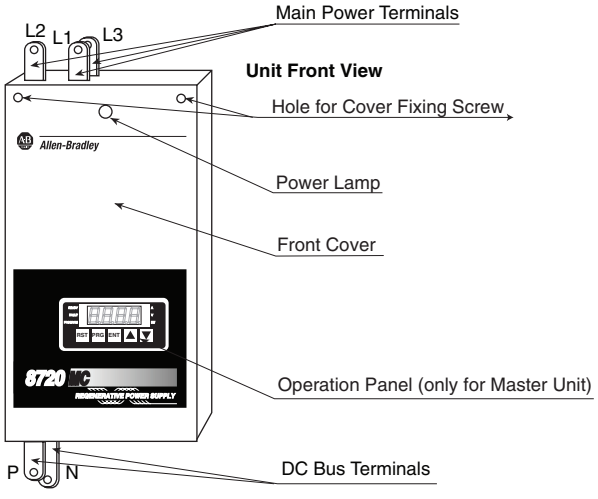


Appearance of Model 8720MC-RPS190

Figure 68 shows the front view of the 8720MC-RPS190 with the front cover installed.

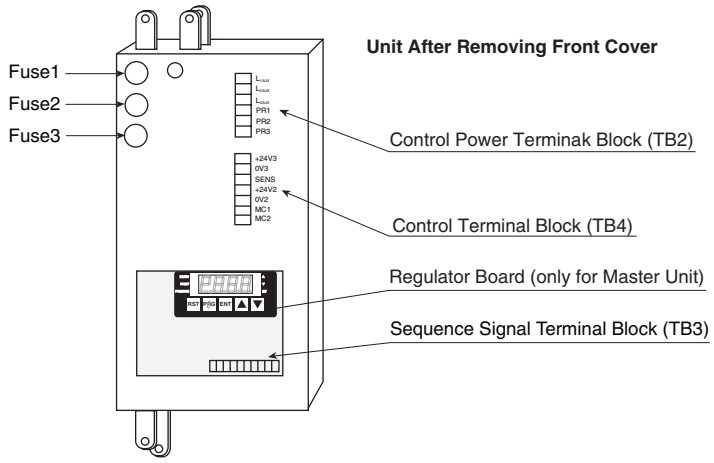
The 8720MC-RPS190 unit has the main power terminals L1, L2, and L3 at the top of the unit, and DC bus terminals P and N at the bottom of the unit.

Figure 68 - Front View of the 8720MC-RPS190 With Cover



When the front cover is removed from the 8720MC-RPS190 Regenerative Power Supply, the Control Power Terminal Block (TB2), the Control Terminal Block (TB4), the Regulator Board (only for master unit), and Sequence Signal Terminal Block (TB3) appear as shown in Figure 69.

Figure 69 - Front View of the 8720MC-RPS190 With Cover Removed



Terminal Blocks on the Main Circuit

This section provides the main circuit block diagram and the description of the main power terminal block (TB1) and the control power terminal block (TB2). The main circuit block diagram for Model 8720MC-RPS065BM and 8720MC-RPS065BS is shown in Figure 70.

Figure 70 - Terminal Blocks on the Main Circuit for RPS065 units

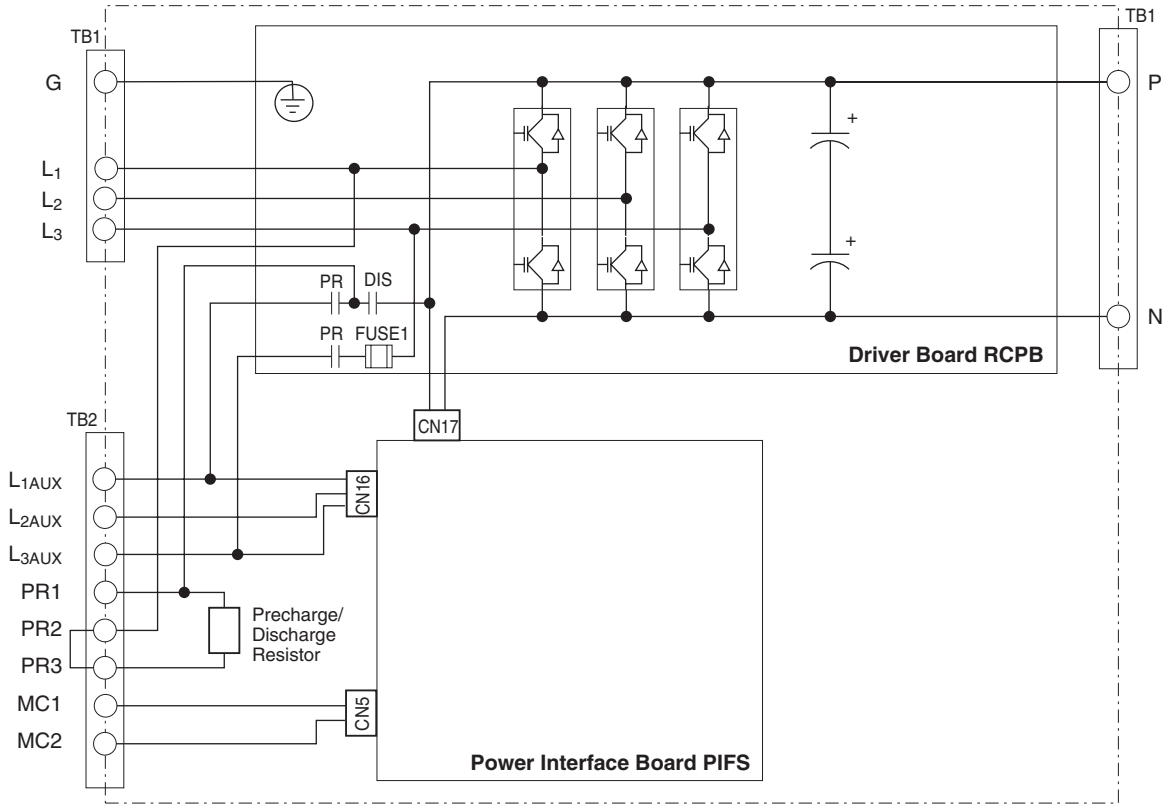
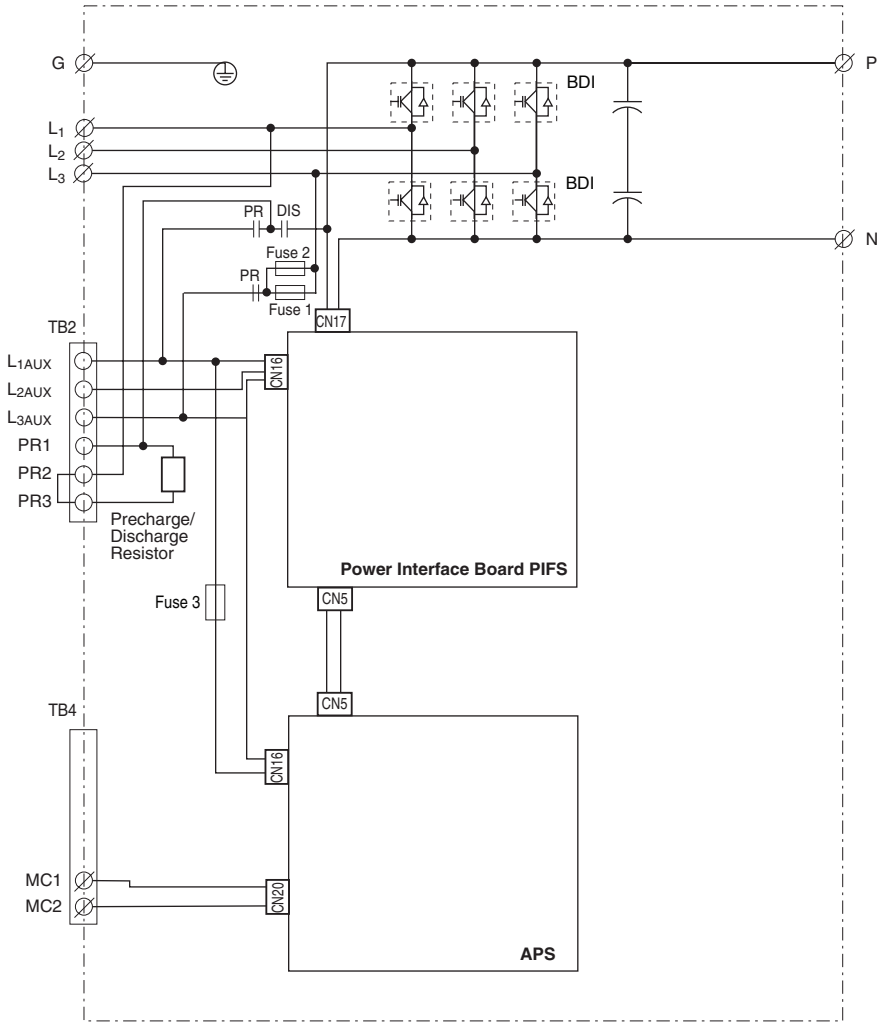


Figure 71 shows the main circuit block diagram for Model 8720MC-RPS190BM and 8720MC-RPS190BS.

Figure 71 - Terminal Blocks on the Main Circuit for RPS190 unit



Main Power Terminal Block (TB1) for Model 8720MC-RPS065

Table 26 describes the terminals on the main power terminal block (TB1) for Model 8720MC-RPS065.

Table 26 - Main Power Terminal Block (TB1) for Model 8720MC-RPS065

Terminal Name	Symbol	Description
Main Power Terminals	L_1, L_2, L_3	To connect three-phase AC input power to the main circuit. For 460 V unit: 380 to 460 VAC +10%, -15%, 50/60 Hz +/-5%
DC Bus Terminals	P, N	To connect the 8720MC-RPS Regenerative Power Supply to load equipment.
Grounding Terminal	G	To ground the 8720MC-RPS Regenerative Power Supply.

Control Power Terminal Block (TB2) for Model 8720MC-RPS065

Table 27 describes the terminals on the control power terminal block (TB2) for Model 8720MC-RPS065.

Table 27 - Control Power Terminal Block (TB2) for Model 8720MC-RPS065

Terminal Name	Symbol	Description
Control Power Terminals	L_{1AUX}, L_{2AUX}, L_{3AUX}	To connect three-phase AC input power to the control circuit. For 460 V unit: 380 to 460 VAC +10%, -15%, 50/60 Hz +/-5%
Terminals to Connect Precharge/Discharge Resistor	PR1, PR2, PR3	To connect precharge/discharge resistor. • When the built-in resistor is used: – Jumper between PR2 and PR3, and open PR1. • When an external resistor is used: – Connect the resistor between PR1 and PR2, and open PR3. • When the unit is connected for power regeneration mode only: – Open all the terminals: PR1, PR2 and PR3.
Control Terminals for Main Magnetic Contactor	MC1, MC2	To be used as the control terminals for the main magnetic contactor (rated for 250 VAC/ 1 Amp or 30 VDC/1 Amp).

Main Power Terminal Bar for Model 8720MC-RPS190

Table 28 describes the terminals on the main power terminal bar for Model 8720MC-RPS190.

Table 28 - Main Power Terminal Bar for Model 8720MC-RPS190

Terminal Name	Symbol	Description
Main Power Terminals	L_1, L_2, L_3	To connect three-phase AC input power to the main circuit. For 460 V unit: 380 to 460 VAC +10%, -15%, 50/60 Hz +/-5%
DC Bus Terminals	P, N	To connect the 8720MC-RPS Regenerative Power Supply to load equipment.
Grounding Terminal	G	To ground the 8720MC-RPS Regenerative Power Supply.

Control Power Terminal Block (TB2) and Control Terminal Block (TB4) for Model 8720MC-RPS190

Table 29 describes the terminals on the control power terminal block (TB2) and the control terminal block (TB4) for Model 8720MC-RPS190.

Table 29 - Control Power Terminal Block (TB2) and Control Terminal Block (TB4) for Model 8720MC-RPS190

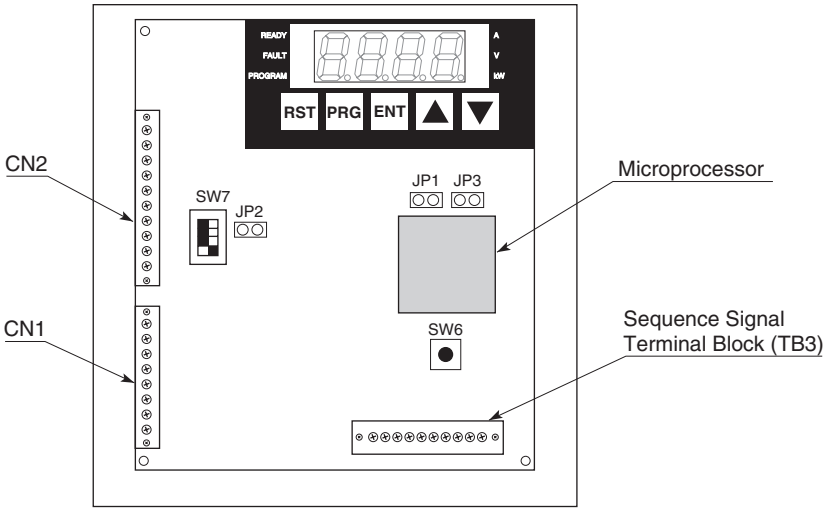
Terminal Name	TBx	Symbol	Description
Control Power Terminals	TB2	L_{1AUX}, L_{2AUX}, L_{3AUX}	To connect three-phase AC input power to the control circuit. For 460 V unit: 380 to 460 VAC +10%, -15%, 50/60 Hz +/-5%
Terminals to Connect Precharge/Discharge Resistor		PR1 PR2 PR3	To connect precharge/discharge resistor. • When the built-in resistor is used: – Jumper between PR2 and PR3, and open PR1. • When an external resistor is used: – Connect the resistor between PR1 and PR2, and open PR3. • When the unit is connected for power regeneration mode only: – Open all the terminals: PR1, PR2 and PR3.
AC Reactor Fan Power Terminals	TB4	+24V3 0V3	To supply AC power to the fan for the AC reactor unit through the EM4000 EMC filter unit.
Terminals for Fan Fault Signal		SENS	To enter fault signal of the fan for the AC reactor unit.
Power Terminals for Main Magnetic Contactor MC and Optional Fan		+24V2 0V2	To supply power to the main magnetic contactor and the fan for the cabinet fan through the 8720MC-EF190 EMC filter unit.
Control Terminals for Main Magnetic Contactor		MC1 MC2	To be used as the control terminals for the main magnetic contactor.

Regulator Board

The Regulator Board exists only on the master unit. The slave unit for parallel connection has no Regulator Board and is controlled by the microprocessor of the Regulator Board on the master unit.

The 8720MC-RPS Regenerative Power Supply regulation is performed by a microprocessor on the Regulator Board. Figure 72 shows the locations of the main components on the Regulator Board. The operation of the 8720MC-RPS Regenerative Power Supply is adjusted by the parameters set by the keypad.

Figure 72 - 8720MC-RPS Regulator Board



PWM Gating Signals

Based on the output of the current/voltage control loop, the Regulator Board sends PWM gating signals through the Power Interface Board to the Power Modules (transistors), producing a pulse-width-modulated (PWM) waveform.

Sequence Output Signals

Sequence output signals are provided from the sequence signal terminal block (TB3) of the Regulator Board to indicate the unit status.

Four-character Display and Six LEDs

A four-character seven-segment light-emitting diode (LED) display is used to monitor values, parameter numbers, parameter values, and error codes. Six LEDs show the display mode of the operation panel and the units of the monitored values.

Jumpers and Switches

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should set jumpers and switches. Read and understand this manual in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: Do not press the reset button switch (SW6) during operation. Also, do not alter the setting of any jumpers and switches during operation. Failure to observe this precaution could result in destruction of the equipment, severe bodily injury or loss of life.

ATTENTION: Do not alter the settings of any jumpers not described in this manual. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

The jumpers JP1 to JP3 and the switches SW6 and SW7 are set at the factory before shipment. If you need to change the jumpers and/or switch settings, read and understand the following description of these jumpers and switches before proceeding.

Jumper JP1 to Enable Operation

Short this jumper to start switching operation of transistors of the 8720MC-RPS Regenerative Power Supply when the RUN sequence input is enabled. This jumper should always be kept closed.

Jumper JP2 to Enable Inspection Mode

Keep this jumper open always.

Reset Switch SW6

Pressing this switch resets the CPU.

IMPORTANT Do not press the reset switch SW6 during operation.

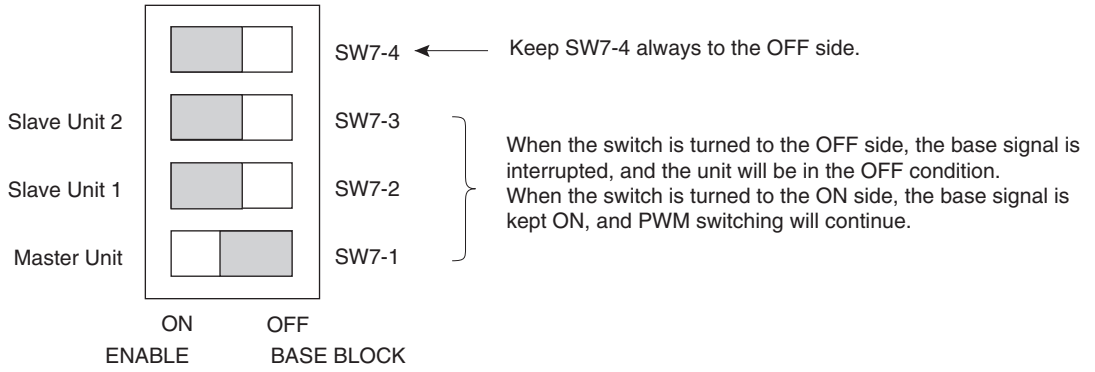
Switch SW7 to Enable Base Block

This switch is used to stop switching of transistors that produce PWM waveform by interrupting the base signal from the Power Modules. To interrupt the base signal, turn the switch to the OFF side.

As shown in Figure 73, SW7 consists of four switches, and SW7-1 to SW7-3 can be allocated to the master unit and slave units 1 and 2. In the case of a master with paralleled slave units, it is possible to interrupt the base signal of each unit by turning the corresponding switch to the OFF side. SW7-4 must always be kept to the OFF side.

When two units are connected in parallel, turn the switches SW7-1 and SW7-2 to the ON side, and when three units are connected in parallel, turn the switches SW7-1 through SW7-3 to the ON side.

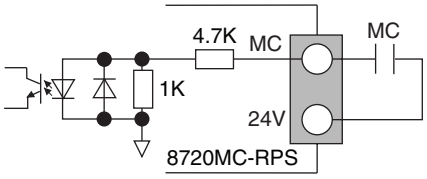
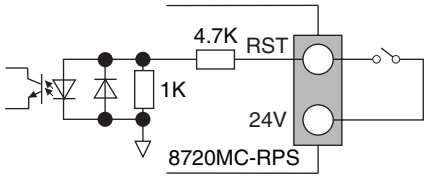
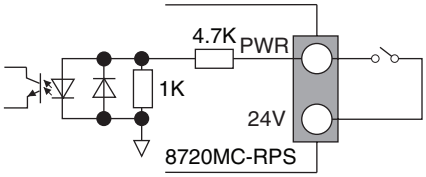
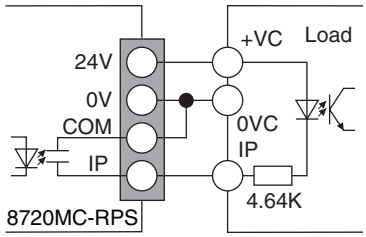
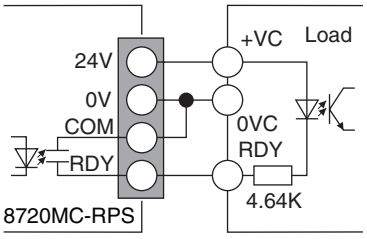
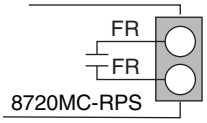
Figure 73 - SW7-x Switches



Sequence Signal Terminal Block (TB3)

As shown in Table 30, there is a sequence signal terminal block (TB3) on the Regulator Board. Table 30 provides the information on each terminal of TB3.

Table 30 - Sequence Signal Terminal Block (TB3)

Name of Terminal	Symbol	Description
Sequence Input Signals	MC	Enter the supplemental contact signal (normally open contact) of the main magnetic contactor.*  * Because driving current of sequence input signals is 5mA and below, use a contact of which minimum applicable load is 5mA and below.
	RST	The reset signal (+24 VDC) is used to reset fault. Close this reset signal as required.*  * Because driving current of sequence input signals is 5mA and below, use a contact of which minimum applicable load is 5mA and below.
	PWR	Enter the RUN signal (+24 VDC)*.  * Because driving current of sequence input signals is 5mA and below, use a contact of which minimum applicable load is 5mA and below.
Power for Sequence Signals	0 V	0 V of +24 VDC power.
	24 V	+24 VDC power (rating : 24 VDC/0.2 Amps).
Sequence Output Signals	COM	Common for IP and RDY signals.
	IP	This is a contact signal that is turned ON during instantaneous power loss (contact rating : 30 VDC/ 50 mA). 
	RDY	This is a contact signal that is turned ON while the unit is ready for operation (contact rating : 30 VDC/ 50 mA). 
	FR, FR	This is a contact signal that opens while fault occurs (contact rating : 250 VAC/1 Amp or 30 VDC/ 1 Amp). 

Wiring

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual in its entirety before proceeding. Failure to observe this precaution could result in destruction of the equipment, severe bodily injury or loss of life.

ATTENTION: The user is responsible for conforming with all the applicable codes. Wiring practices, grounding, disconnects, and overcurrent protection are of particular importance. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: Do not use a megger to perform continuity checks in the equipment. Use higher range of a circuit tester for this purpose. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

ATTENTION: The user is responsible for conforming with all applicable local, national and international codes. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

Recommended Wire Sizes

This section shows the recommended wire sizes for the wires to be used in cabinet. Select the wire sizes in consideration of the following:

- Applicable local, national, and international codes.
- Temperature increase and voltage drop due to type of wires, wiring method, wiring distance, etc.

Recommended Wire Sizes for Power Wiring to the Main Power Terminal Block (TB1) and the Main Power Terminal Bars

Table 31 and Table 32 show the recommended wire sizes for power wiring to the main power terminal block (TB1) and the Main Power Terminal Bars. Table 31 shows the wire sizes for Model 8720MC-RPS065 unit, and Table 32 shows the wire sizes for Model 8720MC-RPS190 unit. The wire sizes shown assume full utilization of the rated capacity of the RPS unit.

Table 31 - Recommended Maximum Wire Sizes for Model 8720MC-RPS065 Unit

Name of Terminal	Symbol	Screw Size	Size of Wire AWG (mm^2)
Main Terminals (Input)	L_1, L_2, L_3	M6	#4 (22 mm^2)
DC Bus Terminals (Output)	P, N	M6	#4 (22 mm^2)
Grounding Terminal (Earth)	G	M6	#5 (22 mm^2)

Table 32 - Recommended Maximum Wire Sizes for Model 8720MC-RPS190 Unit

Name of Terminal	Symbol	Screw Size	Wire Size	Attached Lugs(1)
Main Power Supply Terminals	L_1, L_2, L_3	M10	Larger than 38 mm^2 - 2 in parallel (AWG #2 - 2 in parallel)	JST, R38-10 (M10) (6 Pieces)(2)
DC Bus Terminals	P, N	M10	Larger than 100mm^2 (AWG #4/0)	JST, R100-10 (M10) (2 Pieces)(2)
Grounding Terminal	G	M8	Larger than 38mm^2 (AWG #2)	JST, R38-8 (M10) (1 Piece)(2)

(1) UL-listed wires must be lugged by attached lugs.
(2) JST is Japan Solderless Terminal Co.

Recommended Wire Sizes for Power Wiring to the Control Power Terminal Block (TB2) and the Control Terminal Block (TB4)

Table 33 shows the recommended wire sizes for power wiring to the control power terminal block (TB2) and the control terminal block (TB4).

Table 33 - Recommended Wire Sizes for Power Wiring to the Control Power Terminals and the control terminal block (TB4)

Name of Terminal	Symbol	Screw Size	Size of Wire AWG (mm^2)
Main Terminals (Input)	L_{1AUX}, L_{2AUX}, L_{3AUX}	M6	#12 (3.5mm^2)
DC Bus Terminals (Output)	PR1, PR2, PR3	M6	#12 (3.5mm^2)
Grounding Terminal (Earth)	MC1, MC2	M6	#14 (2.0 mm^2)

Table 34 - Recommended Power Wire Sizes for the 8720MC-EF190-VB Unit

Name of Terminal	Symbol	Screw Size	Wire Size	Attached Lugs(1)
Main Terminals (inputs)	L1, L2, L3	M8	Larger than 38 mm^2 - 2 in parallel (AWG #2 - 2 in parallel)	JST, R38-8 (M8) (6 Pieces)(2)
Main Terminals (outputs)	L4, L5, L6	M10	Larger than 38 mm^2 - 2 in parallel (AWG #2 - 2 in parallel)	JST, R38-10 (M10) (2 Pieces)(2)
Grounding Terminal (Earth)	G	M8	Larger than 38mm^2 (AWG #2)	JST, R38-8 (M8) (1 Piece)(2)

(1) UL-listed wires must be lugged by attached lugs.
(2) JST is Japan Solderless Terminal Co.

For further details on wiring, refer to Chapter 4, Wiring, in the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001.

Adapters and Communications

Note: 1336 REGEN can be connected to any compatible SCANport™ network through an external module. The 8720MC-RPS cannot interface with any network.

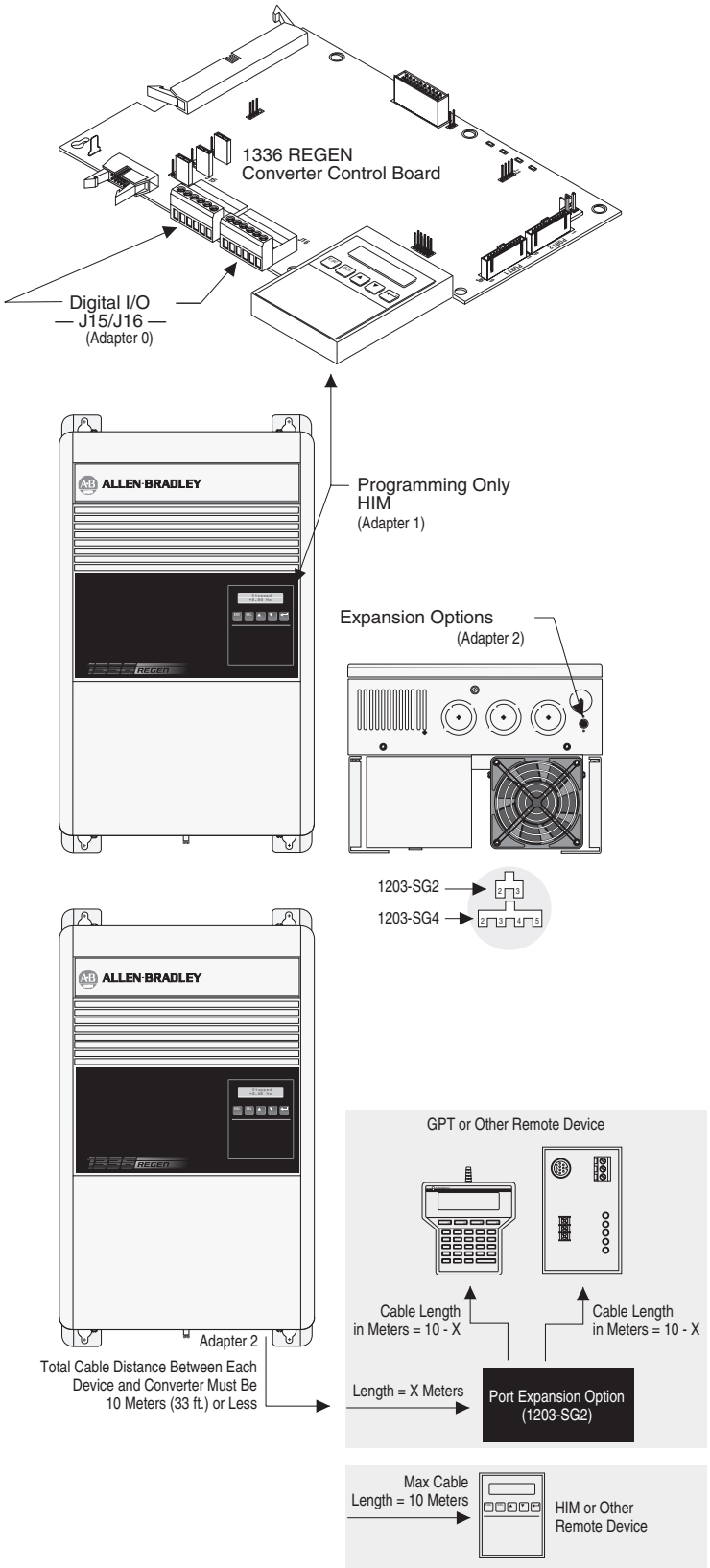
1336 REGEN

Adapter Definitions

Serial communication devices such as the Human Interface Module (HIM) that are connected to the 1336 REGEN Converter are identified by SCANport serial communications as adapters. Depending on the communications options ordered, a number of different adapters are available.

When the Converter-mounted Programming-only HIM is supplied, it is connected as adapter 1 as detailed in Figure 74. Figure 74 also shows the maximum distance allowed between devices.

Figure 74 - 1336 REGEN Adapter Definitions



Human Interface Module (HIM)

HIM Description

When the converter-mounted HIM is supplied, it is connected as Adapter 1 and visible from the front of the converter. The display panel provides a means of programming the 1336 REGEN Converter and viewing the various operating parameters.

IMPORTANT If a Control Panel HIM is connected to the 1336 REGEN Converter, only the Start key and Stop key on the control panel will be functional — The Start key will send an Enable command to the Converter, the Stop key will send a Not Enable command to the Converter.

ATTENTION: When a HIM is not supplied on enclosed NEMA Type 1 (IP 20) 1336 REGEN Controllers, the blank cover plate (option HAB) must be installed to close the opening in the front cover of the enclosure. Failure to install the blank cover plate allows access to electrically live parts which may result in personnel injury and/or equipment damage.

When a HIM is supplied with enclosed NEMA Type 1 (IP 20) 1336 REGEN Converters but has been removed from its mounting cradle for remote operation, the blank cover plate must be installed in its place.

HIM Removal

For handheld operation, the module can be removed and located up to 10 meters (33 feet) from the 1336 REGEN Converter.

ATTENTION: Some voltages present behind the 1336 REGEN Converter front cover are at incoming line potential. To avoid an electric shock hazard, use extreme caution when removing/replacing the HIM.

Figure 75 - 1336 REGEN HIM

HIM Operation

ESC	**ESCape** When pressed, the escape key will cause the programming system to go back one level in the menu tree.
SEL	**SELect** Pressing the select key alternately causes the top or bottom line of the display to become active. The flashing first character indicates which line is active.
▲ ▼	**Increment/Decrement** These keys are used to increment and decrement a value or scroll though different parameters.
↵	**Enter** When pressed, a parameter will be selected or a parameter value will be entered into memory. After a parameter has been entered into memory, the top line of the display will automatically become active, allowing another parameter to be chosen.

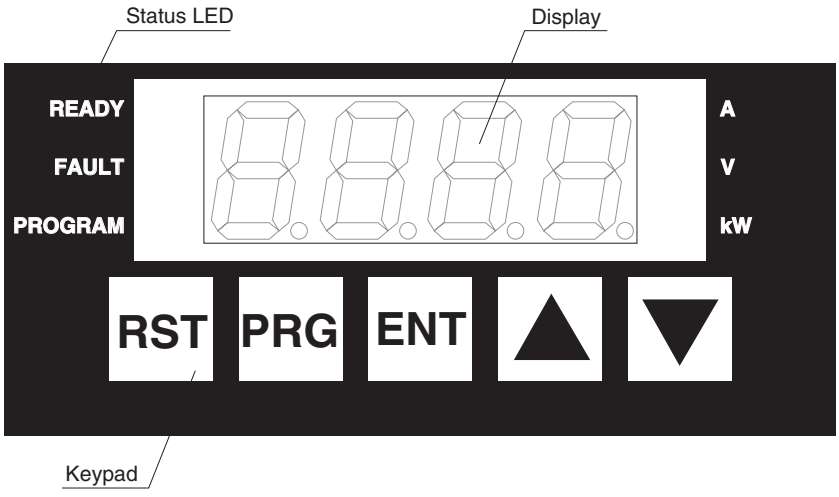
8720MC-RPS

This section describes the configuration of the operation panel and the operation modes.

Configuration of the Operation Panel

The operation panel is used for setting parameters, monitoring operating conditions, and resetting faults. Figure 76 shows the configuration of the operation panel and the names of the components.

Figure 76 - 8720MC-RPS Configuration of the Operation Panel



On the keypad of the operation panel there are five push-button switches used for selecting monitoring information, setting parameters, and resetting faults.

The display on the operation panel consists of four seven-segment LEDs that display monitored values, parameter numbers, parameter values, and error codes.

Six status LEDs on the operation panel display the operation status and the units of the monitored values.

Operation Modes

The operation panel operates in the two modes:

- Monitor mode
- Program mode

In monitor mode, you can monitor various operating conditions including input current of the 8720MC-RPS Regenerative Power Supply, DC bus voltage, etc. In program mode, you can view and change parameter values, and examine the error log.

Monitor Mode

Monitor mode is the operation mode to display operating conditions. The following data can be displayed in this mode:

- Input current *
- AC input power voltage
- DC bus voltage
- Power
- Load ratio.

* The displayed value of input current is only an approximate value and no accuracy can be guaranteed. If you need an accurate input current, measure it by using a dedicated measuring device.

To select a value to monitor, press the ▲ key or the ▼ key until the desired value is displayed. Pressing the ▲ key or the ▼ key will move you through the each of the displays.

The unit of the displayed value is shown by turning ON the status LEDs as follows:

- "A": Shows the unit when the input current is displayed.
- "V": Shows the unit when monitoring the AC input power voltage or the DC bus voltage.
- "KW": Shows the unit when monitoring the power.
- Turning OFF all LEDs: Shows the unit when the load ratio is displayed.

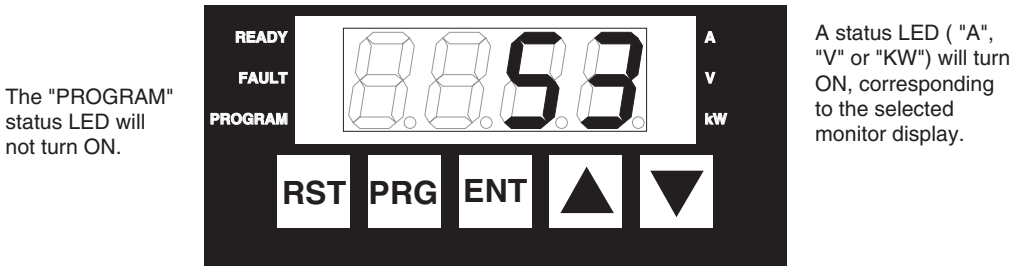
In both cases of monitoring the AC input power voltage and the DC bus voltage, the "V" status LED is ON. You can judge which item is being monitored, by the display order. The unit of the load ratio is percent (%). But in this case, no status LED is ON.

In case of monitoring the power, the "KW" status LED is ON continuously when the operation is in power running, and the "KW" status LED flashes when the operation is regenerative.

In monitor mode, the "PROGRAM" status LED is turned OFF, indicating that the operation panel is not in program mode.

When any fault occurs, the operation panel cannot be changed to monitor mode.

Figure 77 - Example of Display in Monitor Mode



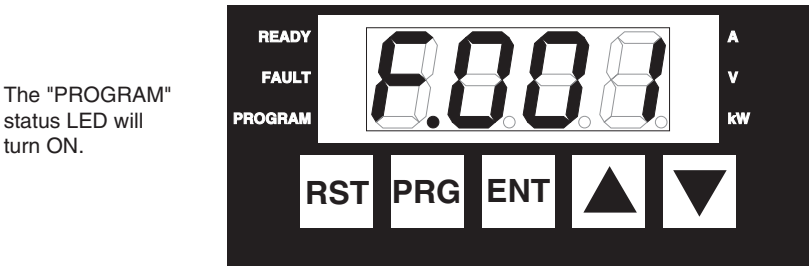
Program Mode

Program mode allows you to display and modify parameter values, and to display the error log. The following can be displayed in program mode:

- Types of parameters
- Parameter numbers
- Parameter values
- Selection of error log
- Error log number
- Error codes.

In program mode, the "PROGRAM" status LED is ON, indicating that the operation panel is in program mode.

Figure 78 - Example of Display in Program Mode

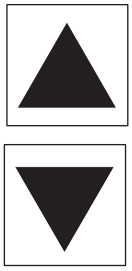


Display

The display portion of the operation panel is a four-character, seven-segment LED. When the unit is powered up, SELF is displayed as the 8720MC-RPS Regenerative Power Supply performs the power-up self-diagnostics. When the diagnostics are completed, the display indicates various monitor values, parameter numbers, parameter values, and error codes.

Keypad

The keypad portion of the operation panel has five push-button switches that are used to select monitoring items, to set parameters, and to reset faults.

	The UP (▲) and DOWN (▼) arrow keys are used to: • Select monitoring items in monitor mode. • Select parameters, and move through the error log in case of program mode. • Increase or decrease a numeric value when a parameter value is displayed. Holding down these keys will increase the scroll speed.
	The ENT key is used to: • Display a selected parameter value and the contents of the error log in program mode. • Save a parameter value when the parameter value is displayed.
	The PRG key is used to: • Move between program and monitor modes. The "PROGRAM" status LED will turn OFF when the operation panel is in monitor mode and turn ON when the operation panel is in program mode. • Return to the display of parameter number without saving a parameter value when a parameter value is displayed.
	The RST key is used to: • Reset fault when fault occurred and the display shows the error code. Before resetting fault, remove the reasons of the fault. Note that when the RUN sequence signal has entered, fault cannot be reset.

Status LEDs

The operation panel contains six LEDs that show the present status of the 8720MC-RPS Regenerative Power Supply. Each status LED has the following meaning.

Table 35 - Status LED Descriptions

LED	Status	Meaning
Ready	On	PWM switching is being performed.
	Off	PWM switching is not performed.
Fault	On	Fault occurred, or the error log is being displayed.
	Off	Operation is normal.
Program	On	The operation panel is in program mode.
	Off	The operation panel is in monitor mode.
A	On	The root mean square value of the monitored input current is displayed in the unit of ampere.(1)

LED	Status	Meaning
V	On	The root mean square value of the monitored AC input power voltage or DC bus voltage is displayed in the unit of volt.
KW	On	The monitored power (power running) is displayed in the unit of kilowatt.
	Flashing	The monitored power (regenerated) is displayed in the unit of kilowatt.
A, V, and KW	Off	The load ratio(2) is displayed in the unit of % when A, V, and KW are turned OFF in monitor mode.

(1) The displayed value of input current is only an approximate value and no accuracy can be guaranteed. If you need an accurate value, measure it by using a dedicated measuring device.

(2) The load ratio is a ratio of the input current to the rated current.

Wiring Examples and Components

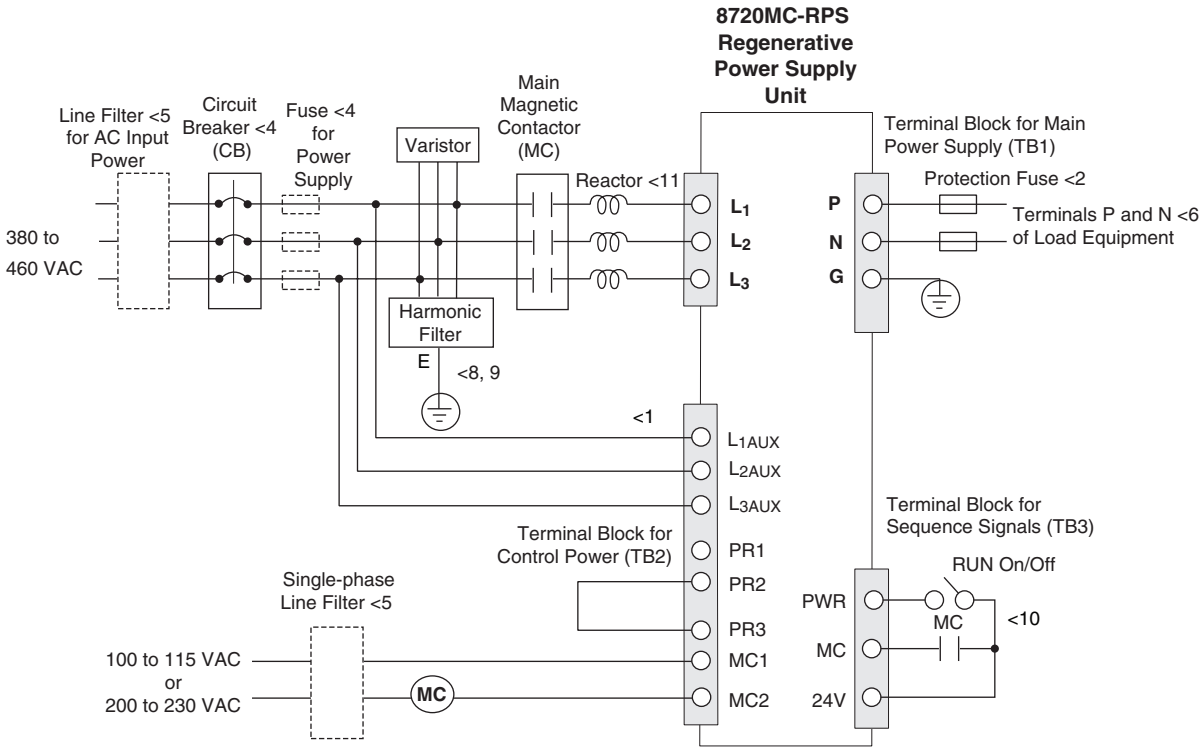
ATTENTION: Special caution must be paid to wiring to the 8720MC-RPS Regenerative Power Supply when connecting multiple units in parallel. The phases of AC input power to the main power supply terminals (L_1, L_2 and L_3) and to the control power terminals (L_{1AUX}, L_{2AUX}, and L_{3AUX}) and the polarity of DC bus output (P and N) of all the connected units must be the same. Failure to observe this precaution could result in destruction of the equipment, severe bodily injury or loss of life.

Note: The 8720MC-RPS027 unit is no longer available.

8720MC-RPS065 Wiring Examples

Single Unit

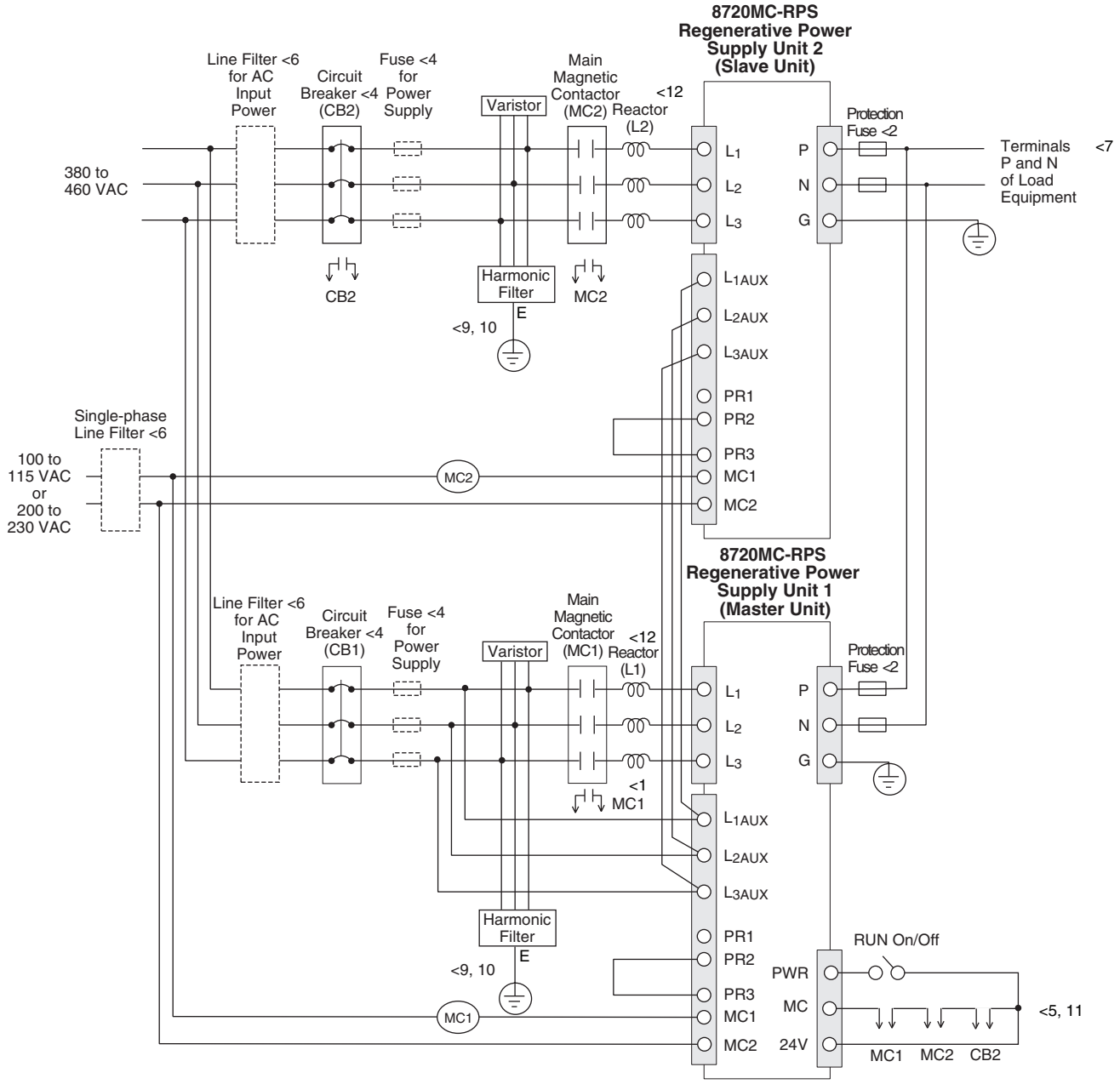
Figure 79 - Typical Connection of AC Input Power Wiring for Single Unit of Model 8720MC-RPS065



1> The phases of the AC input power to the main supply terminals L_1, L_2 and L_3 must be same as those of the control power to the control power terminals L_{1AUX}, L_{2AUX} and L_{3AUX}.
2> It is recommended to install the DC bus protection fuses on the both lines to the terminals P and N to prevent ground fault, when more than one drive is connected to the 8720MC-RPS Regenerative Power Supply.
3> Turn ON the switch SW7-1 on the Regulator Board without fail.
4> Both a three-phase circuit breaker and fuses are not required. Check your local code to determine if fuses should be used instead of a circuit breaker.
5> When the 8720MC-RPS Regenerative Power Supply must conform with the requirements of CE Mark, install a line filter in the AC input power line and a single-phase line filter in the power supply line to the main magnetic contactor.
6> The length of the DC bus wiring runs should not exceed 2 m (6.5 ft). It is also recommended to use twisted shielded cable.
7> The length of the wiring in the cabinet must be as short as possible.
8> The length of the wiring from the E terminal of the Harmonic Filter to the Grounding Terminal must be as short as possible.
9> The physical location of the Harmonic Filter and Varistor relative to the Contactor and Line Reactor is important. Connect these devices in the relative positions shown in this illustration.
10> Because driving current of sequence input signals is 5mA and below, use a contact of which minimum applicable load is 5mA and below.
11> Use the reactor in maximum surrounding air temperature of 55 °C (131 °F) and below.

Two Paralleled Units

Figure 80 - Typical Connection of AC Input Power Wiring for Two Paralleled Units of Model 8720MC-RPS065



1> The phases of the AC input power to the main supply terminals L_1, L_2 and L_3 must be same as those of the control power to the control power terminals L_{1AUX}, L_{2AUX} and L_{3AUX}. The phases of the control power L_{1AUX}, L_{2AUX} and L_{3AUX} for the slave unit(s) must also be same as those for the master unit.

2> It is recommended to install the DC bus protection fuses on the both lines to the terminals P and N to prevent ground fault, when more than one drive is connected to the 8720MC-RPS Regenerative Power Supply.

3> Turn ON the switches SW7-1 and SW7-2 on the Regulator Board without fail.

4> Both a three-phase circuit breaker and fuses are not required. Check your local code to determine if fuses should be used instead of a circuit breaker.

5> The slave circuit breaker must be provided with an auxiliary contact as a safety interlock to the master. Use fuses with a slightly higher current rating if your local code requires them.

6> When the 8720MC-RPS Regenerative Power Supply must conform with the requirements of CE Mark, install a line filter in the AC input power line and a single-phase line filter in the power supply line to the main magnetic contactor.

7> The length of the DC bus wiring runs should not exceed 2 m (6.5 ft). It is also recommended to use Bus bar for the common bus sized to 1.75 times the total continuous current output of the RPS units.

8> The length of the wiring in the cabinet must be as short as possible.

9> The length of the wiring from the E terminal of the Harmonic Filter to the Grounding Terminal must be as short as possible.

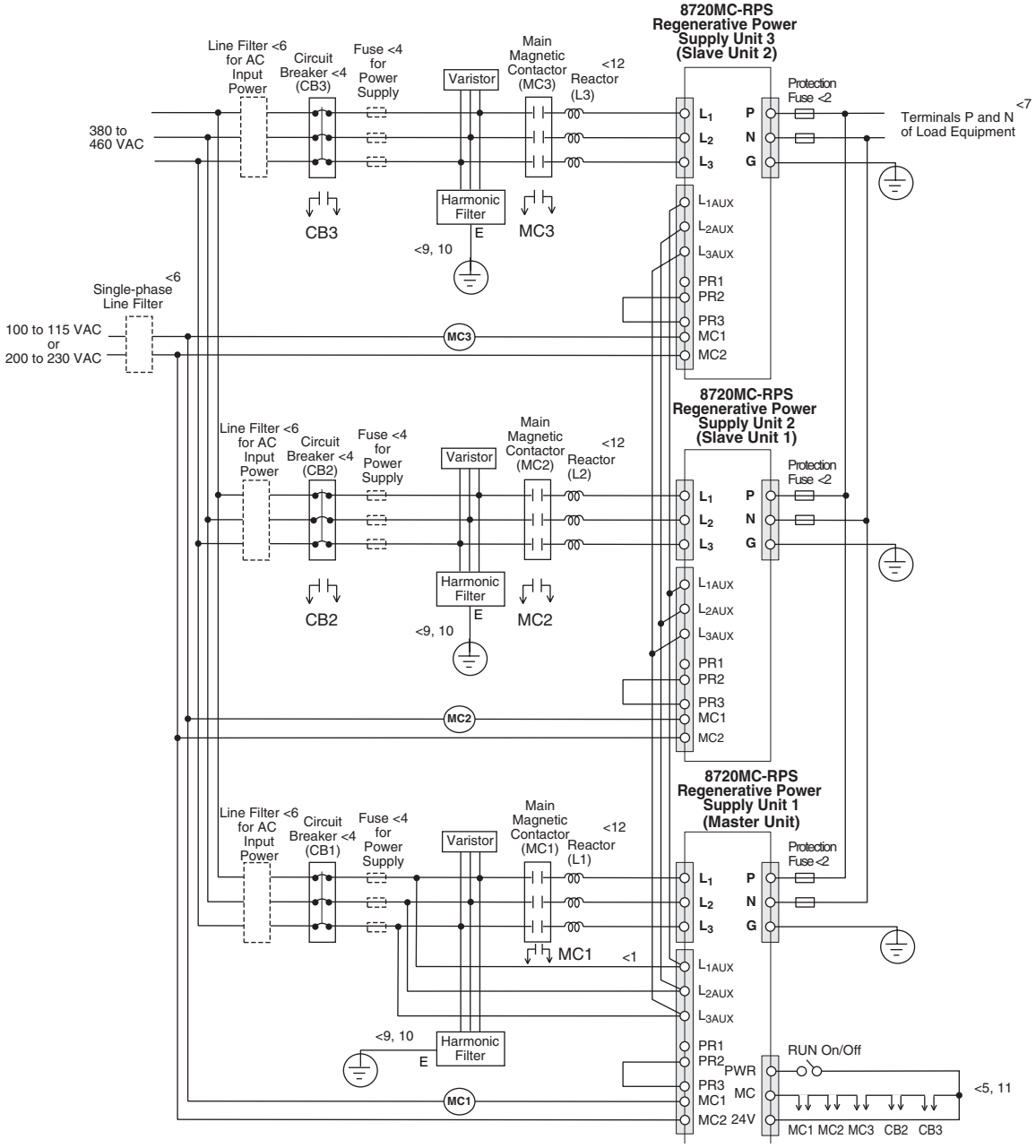
10> The physical location of the Harmonic Filter and Varistor relative to the Contactor and Line Reactor is important. Connect these devices in the relative positions shown in this illustration.

11> Because driving current of sequence input signals is 5mA and below, use a contact of which minimum applicable load is 5mA and below.

12> Use the reactor in maximum surrounding air temperature of 55 °C (131 °F) and below.

Three Paralleled Units

Figure 81 - Typical Connection of AC Input Power Wiring for Three Paralleled Units of Model 8720MC-RPS065



1> The phases of the AC input power to the main supply terminals L_1, L_2 and L_3 must be same as those of the control power to the control power terminals L_{1AUX}, L_{2AUX} and L_{3AUX}. The phases of the control power L_{1AUX}, L_{2AUX} and L_{3AUX} for the slave unit(s) must also be same as those for the master unit.

2> It is recommended to install the DC bus protection fuses on the both lines to the terminals P and N to prevent ground fault, when more than one drive is connected to the 8720MC-RPS Regenerative Power Supply.

3> Turn ON the switches SW7-1, SW7-2 and SW7-3 on the Regulator Board without fail.

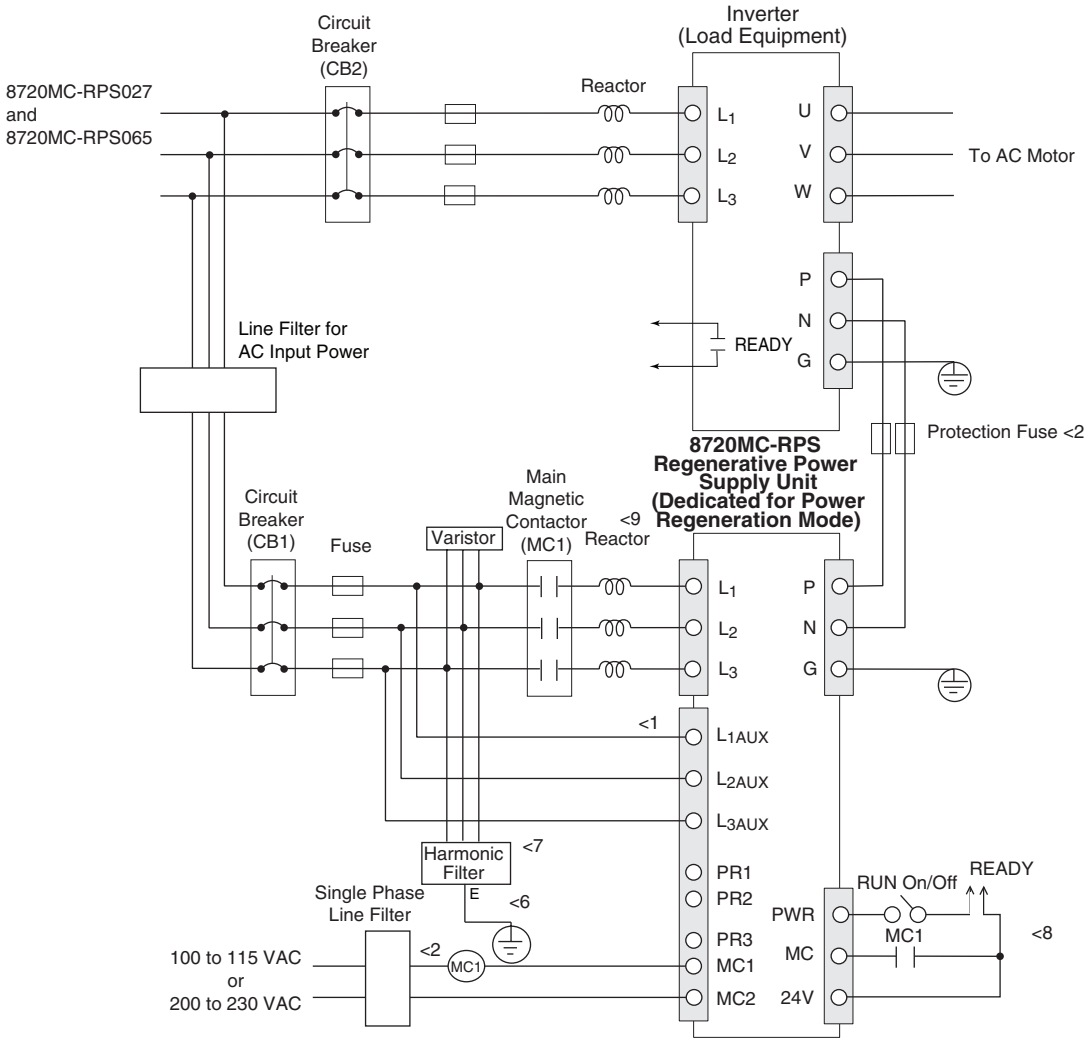
4> Both a three-phase circuit breaker and fuses are not required. Check your local code to determine if fuses should be used instead of a circuit breaker.

5> The slave circuit breaker must be provided with an auxiliary contact as a safety interlock to the master. Use fuses with a slightly higher current rating if your local code requires them.

6> When the 8720MC-RPS Regenerative Power Supply must conform with the requirements of CE Mark, install a line filter in the AC input power line and a single-phase line filter in the power supply line to the main magnetic contactor.
7> The length of the DC bus wiring runs should not exceed 2 m (6.5 ft). It is also recommended to use Bus bar for the common bus sized to 1.75 times the total continuous current output of the RPS units.
8> The length of the wiring in the cabinet must be as short as possible.
9> The length of the wiring from the E terminal of the Harmonic Filter to the Grounding Terminal must be as short as possible.
10> The physical location of the Harmonic Filter and Varistor relative to the Contactor and Line Reactor is important. Connect these devices in the relative positions shown in this illustration.
11> Because driving current of sequence input signals is 5mA and below, use a contact of which minimum applicable load is 5mA and below.
12> Use the reactor in maximum surrounding air temperature of 55 °C (131 °F) and below.

When Used as a Converter for Power Regeneration Mode Only

Figure 82 - Wiring for Model 8720MC-RPS065 Unit Used as a Converter for the Power Regeneration Mode Only



1> The phases of the AC input power to the main supply terminals L_1, L_2 and L_3 must be same as those of the control power to the control power terminals L_{1AUX}, L_{2AUX} and L_{3AUX}.

2> It is recommended to install the DC bus protection fuses on the both lines to the terminals P and N to prevent ground fault, when plural number of load equipment is connected to the 8720MC-RPS Regenerative Power Supply.
3> Turn ON the switch SW7-1 on the Regulator Board without fail.
4> Wiring to be taken into cabinet must be as short as possible.
5> This connection is only used with AC input drives.
6> The length of the wiring from the E terminal of the Harmonic Filter to the Grounding Terminal must be as short as possible.
7> The physical location of the Harmonic Filter and Varistor relative to the Contactor and Line Reactor is important. Connect these devices in the relative positions shown in this illustration.
8> Because driving current of sequence input signals is 5mA and below, use a contact of which minimum applicable load is 5mA and below.
9> Use the reactor in maximum surrounding air temperature of 55 °C (131 °F) and below.

It is possible to select the 8720MC-RPS units depending on the regenerative power when only regenerated power of the unit integrating converter and inverter is used. In this case, however, the following cautions must be observed. Figure 82 shows wiring of the 8720MC-RPS065 unit used as a converter for the power regeneration mode only.

- Rating of regenerative power of the 8720MC-RPS is less than rated power both in the instantaneous rating and continuous rating.
- When rectifier portion of inverter is composed of thyristor, CR snubber circuit between anode and cathode of thyristor may become overloaded. Therefore, treating time for regenerative power must be within 5 seconds for 3 minutes. Because the current "ICR" flowing through CR snubber circuit in the power regeneration mode is represented by the following formula, verify the specifications of CR snubber circuit.

  – $I_{CR}\,[A] \fallingdotseq (8 - 0.03 \times R\,[\Omega]) \times \sqrt{C\,[\mu F]}$

- Do not fail to connect ACL unit of 3% impedance toward inverter rating with the AC input line of inverter. Without ACL unit, excessive circulating current will flow between the 8720MC-RPS units.
- Even during the power running, current will be supplied from the 8720MC-RPS unit to DC bus proportionally to the impedance ratio of both reactors at the 8720MC-RPS unit and inverter. This current must not exceed the rating of the 8720MC-RPS unit.
- Set the parameter of the FWD Current Limit (U.001) to zero (0).
- Set the parameter of the Discharging Function Enable (F.017) to zero (OFF).
- Set the DC bus voltage to start power regeneration to the parameter of the DC Bus Voltage Reference (U.000).

- Open all the terminals PR1, PR2, and PR3 for connecting precharge/discharge resistor. Because these terminals are open, the unit does not perform precharge/discharge operations. Precharge/discharge must be performed on inverter side.

- Do not fail to enter the READY signal of inverter to (PWR).

When Adapted to Capacitors Having Large Capacity

8720MC-RPS065 units charge to capacitors with a single phase, full-wave rectification circuit through the built-in precharge/discharge resistor. When the load capacitors have large capacitance, it takes more time for charging, and the wattage of the internal resistor becomes insufficient. When the load capacitance is large, disable the built-in precharge/discharge resistor and connect an external resistor or external circuit for precharging/discharging (Note that minimum precharging/ discharging cycle is 3 minutes).

Calculate the rated wattage of the external precharge/discharge resistor to be connected to the outside in accordance with the following formula depending on the total capacitance of all the capacitors including the built-in capacitor.

- Rated wattage [W] = 17000 x C[F]
- But, serge resistivity of J[J] = 28000 x C[F] must be provided

When an external precharge/discharge resistor is connected between PR1 and PR2, change the set value of the following parameters, if necessary.

- Precharge/Discharge Time (F.014)
- Wattage of Precharge/Discharge Resistor (F.015)

Table 36 - Maximum Applicable Capacitance of Capacitor and Minimum Resistance Value (8720MC-RPS065 unit)

Capacity of built-in Capacitor	1900µF
Built-in Resistor (Resistance Value/Wattage)	7000µF (22 ohm/120W)
External Resistor (Minimum Resistance Value), Connect to PR1 and PR2	110000µF (20 ohm)
External Circuit (Minimum Resistance Value), Refer to Figure 82.	220000µF (4.7 ohm)

External Resistor Case

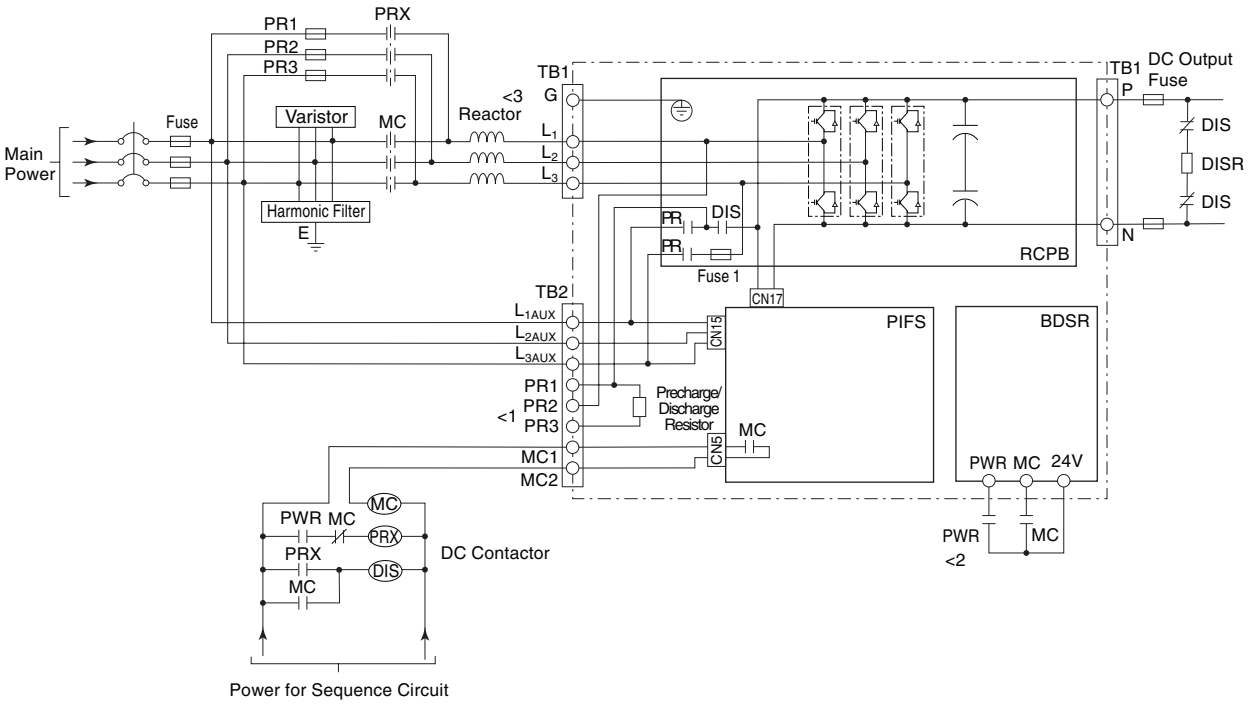
Most applications are successfully integrated using the internal precharge resistor provided in the 8720MC-RPS Regenerative Power Supply. For instances where there is a large amount of load capacitance, caused by connecting several 8720MC drives to a single 8720MC-RPS Regenerative Power Supply, an external

precharge resistor may be required. To determine the total capacitance C[F], add the capacitance for the RPS065 unit as determined from row 1 of Table 36 to the sum of the drive capacitance as determined by the drive specifications. If the total capacitance of the RPS065 is above 7,000µf but less than 110,000µf, an external resistor connected to PR1 and PR2 is required. Table 36 provides the minimum resistance value for the external precharge resistor, 20 ohms for the RPS065. The wattage [W] is determined by the equation presented above. Connect the external precharge resistor to terminals PR1 and PR2 on terminal block TB2. Terminal PR3 should be left open (see Figure 70). The Precharge/Discharge Time (F.014) may require a larger value to accommodate the increased precharge time. The Wattage of Precharge/Discharge Resistor (F.015) should also be increased to the external precharge resistor wattage.

External Circuit Case

If the total capacitance of the RPS065 is above 110,000µf, but less than 220,000µf, an external resistor connected as shown in Figure 83 must be provided. Table 36 provides the minimum resistance value for the external precharge resistor: 4.7 ohms for the RPS065. The wattage [W] is determined by the equation on page 109.

Figure 83 - Example of Wiring when Precharge/Discharge Circuit of the 8720MC-RPS065 is Configured with an External Circuit



1> Remove the jumper between PR2 and PR3.

2> Because driving current of sequence input signals is 5mA and below, use a contact of which minimum applicable load is 5mA and below.

3> Use the reactor in maximum surrounding air temperature of 55 °C (131 °F) and below.

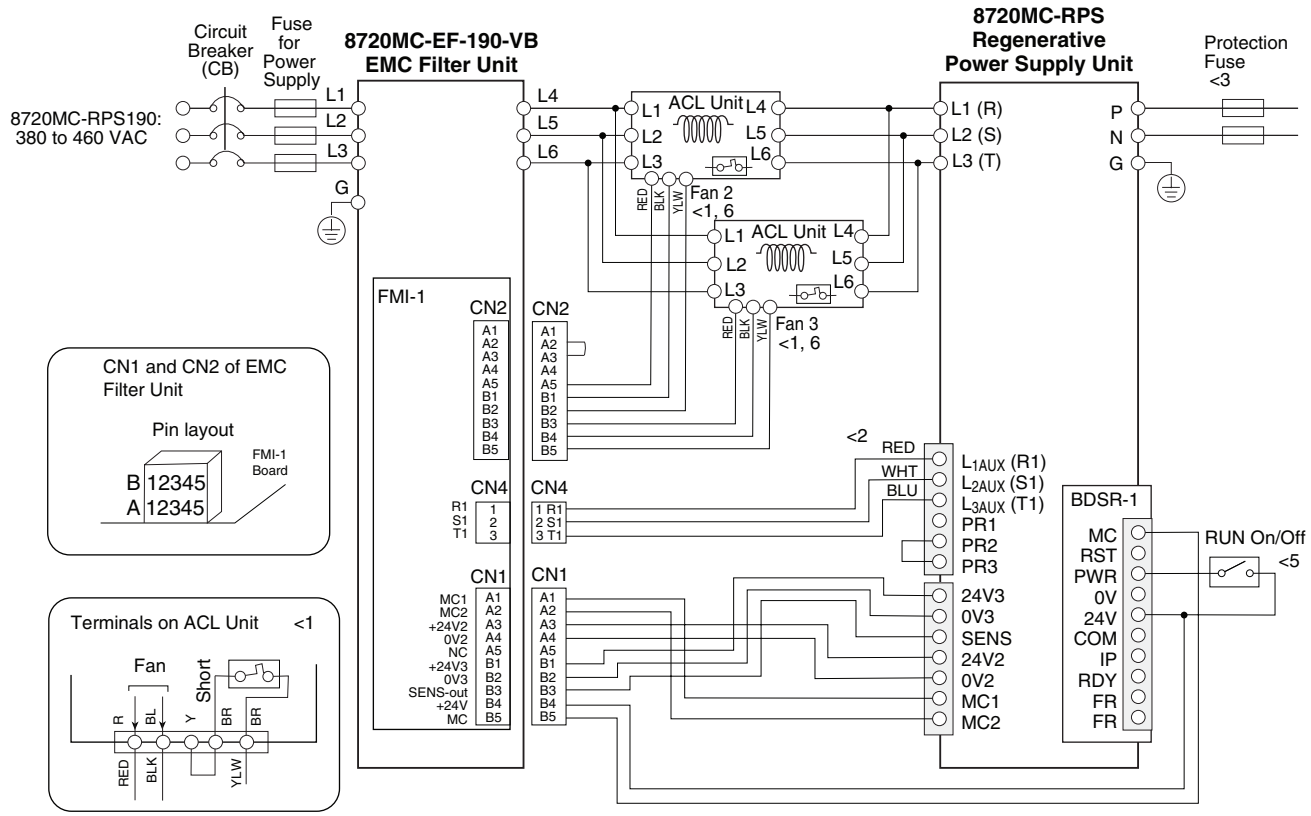
If a totally external resistor network is used as shown in Figure 83, the calculated wattage, [W] = 17,000 x C farads, is divided in half to size the precharge and discharge resistors.

Note: Parameter F.015 should be set to the sum of the wattage for both resistors.

8720MC-RPS190 Wiring Examples

Single Unit

Figure 84 - Typical Connection of AC Input Power Wiring for Single Unit of Model 8720MC-RPS190 Unit



1> Refer to the lower left corner of Figure 84 indicating the terminals on the ACL unit. When the fan inside the ACL unit is connected with an external power supply, do not fail to connect with the power supply designated by NEC Class 2 (Power supply limited to 100VA and below and 8A and below even in case of Error). Avoid the high voltage portion and the high temperature portion of the ACL unit when wiring the fan inside the ACL unit.

2> The phases of the AC input power to the main supply terminals L1, L2 and L3 must be same as those of the control power to the control power terminals L1AUX, L2AUX and L3AUX.

3> It is recommended to install the DC bus protection fuses on the both lines to the terminals P and N to prevent ground fault, when plural number of load equipment is connected to the 8720MC-RPS Regenerative Power Supply.

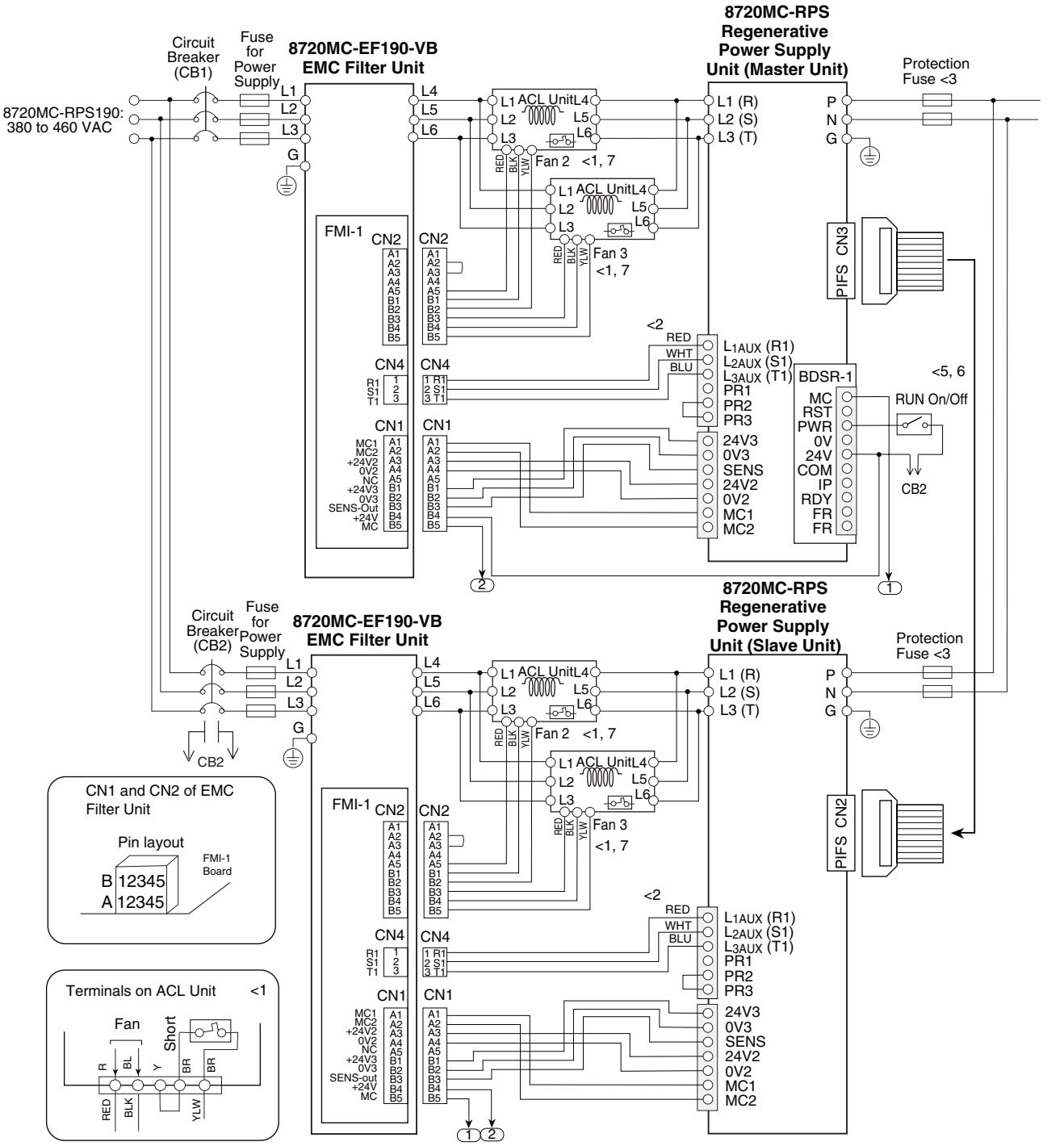
4> Turn ON the switch SW7-1 on the Regulator Board without fail.

5> Because driving current of sequence input signals is 5mA and below, use a contact of which minimum applicable load is 5mA and below.

6> Use the ACL unit in maximum surrounding air temperature of 55 °C (131 °F) and below.

Two Paralleled Units

Figure 85 - Typical Connection of AC Input Power Wiring for Two Paralleled Units of Model 8720MC-RPS190

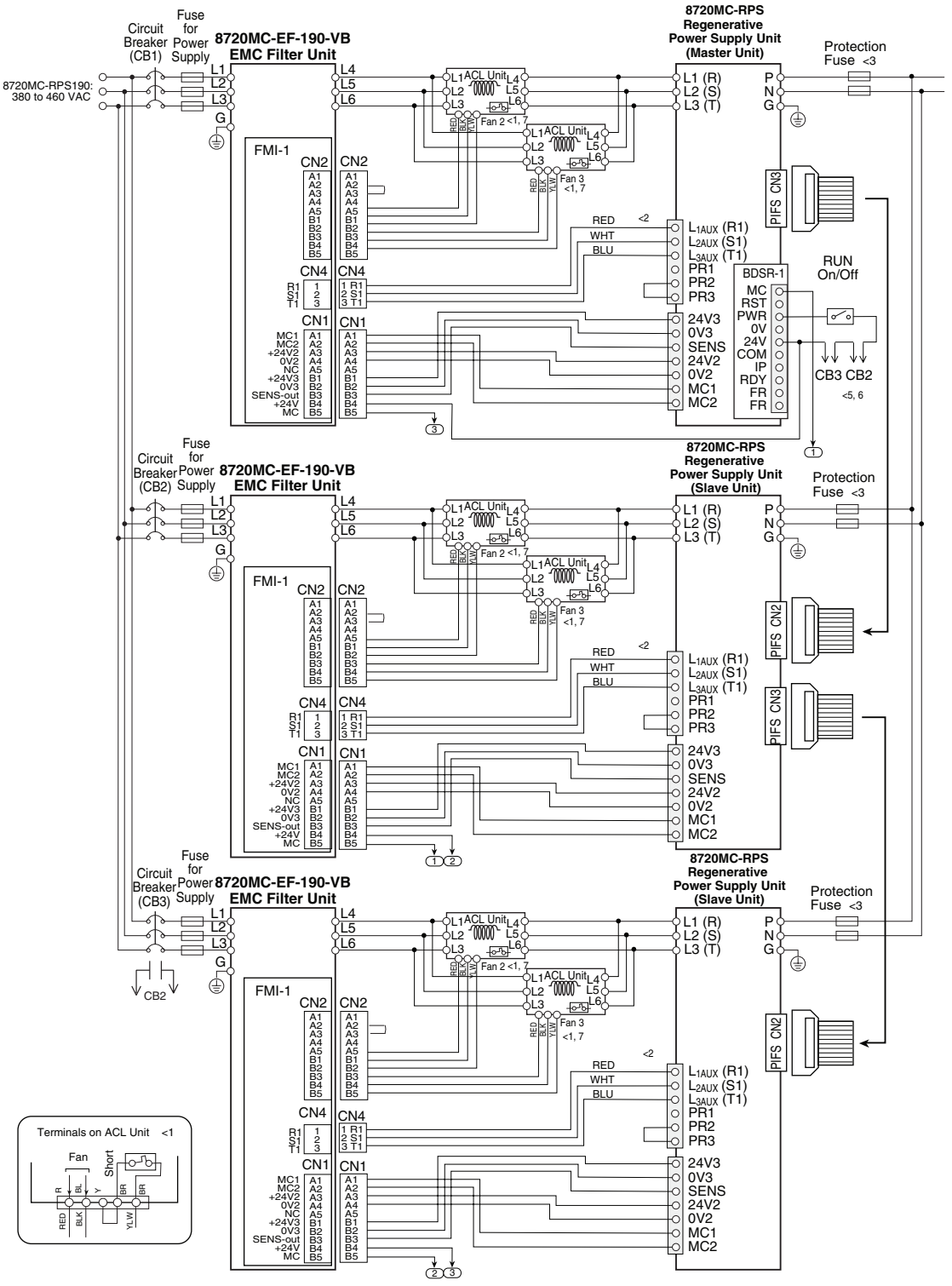


1> Refer to the lower left corner of Figure 4.7 indicating the terminals on the ACL unit. When the fan inside the ACL unit is connected with an external power supply, do not fail to connect with the power supply designated by NEC Class 2 (Power supply limited to 100VA and below, and 8A and below even in case of Error). Avoid the high voltage portion and the high temperature portion of the ACL unit when wiring the fan inside the ACL unit.

2> The phases of the AC input power to the main supply terminals L1, L2 and L3 must be same as those of the control power to the control power terminals L1AUX, L2AUX and L3AUX.
3> It is recommended to install the DC bus protection fuses on the both lines to terminals P and N to prevent ground fault, when plural number of load equipment is connected to the 8720MC-RPS Regenerative Power Supply.
4> Turn on the switch SW7-1 and SW7-2 on the Regulator Board without fail.
5> Slave circuit breakers must be provided with an auxiliary contact as a safety interlock to the master. Use fuses with a slightly higher current rating also if your local code requires them.
6> Because driving current of sequence input signals is 5mA and below, use a contact of which minimum applicable load is 5mA and below.
7> Use the ACL unit in maximum surrounding air temperature of 55 °C (131 °F) and below.

Three Paralleled Units

Figure 86 - Typical Connection of AC Input Power Wiring for Three Paralleled Units of Model 8720MC-RPS190



1> Refer to the lower left corner of Figure 86 indicating the terminals on the ACL unit. When the fan inside the ACL unit is connected with an external power supply, do not fail to connect with the power supply designated by

NEC Class 2 (Power supply limited to 100VA and below, and 8A and below even in case of Error). Avoid the high voltage portion and the high temperature portion of the ACL unit when wiring the fan inside the ACL unit.

2> The phases of the AC input power to the main supply terminals L1, L2 and L3 must be same as those of the control power to the control power terminals L1AUX, L2AUX and L3AUX.

3> It is recommended to install the DC bus protection fuses on the both lines to terminals P and N to prevent ground fault, when plural number of load equipment is connected to the 8720MC-RPS Regenerative Power Supply.

4> Turn on the switch SW7-1, SW7-2 and SW7-3 on the Regulator Board without fail.

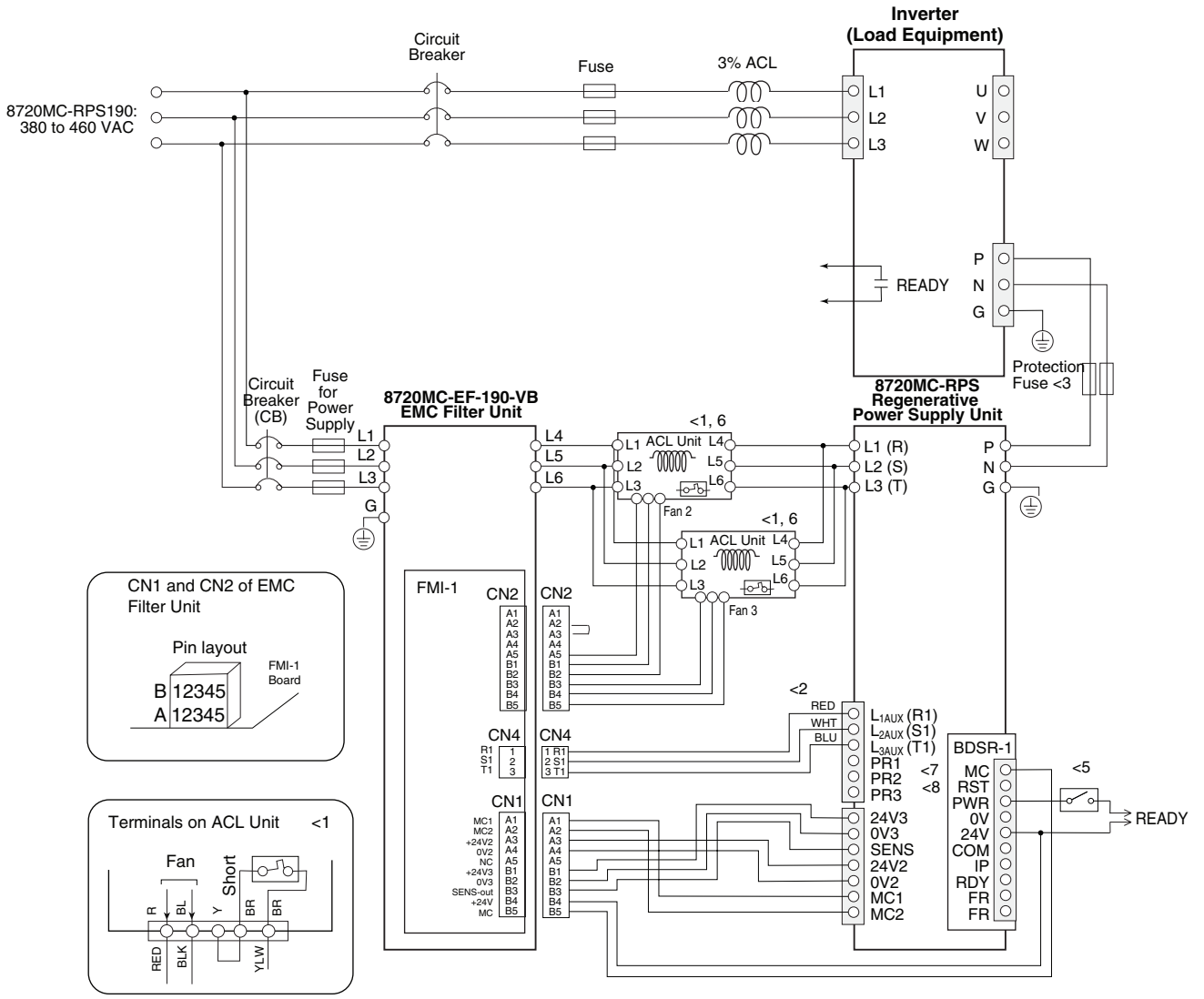
5> Slave circuit breakers must be provided with an auxiliary contact as a safety interlock to the master. Use fuses with a slightly higher current rating also if your local code requires them.

6> Because driving current of sequence input signals is 5mA and below, use a contact of which minimum applicable load is 5mA and below.

7> Use the ACL unit in maximum surrounding air temperature of 55 °C (131 °F) and below.

When Used as a Converter for Power Regeneration Mode Only

Figure 87 - Wiring Model 8720MC-RPS190 Used as a Converter for the Power Regeneration Mode Only



1> Refer to the lower left corner of Figure 87 indicating the terminals on the ACL unit. When the fan inside the ACL unit is connected with an external power supply, do not fail to connect with the power supply designated by NEC Class 2 (Power supply limited to 100VA and below, and 8A and below even in case of Error). Avoid the high voltage portion and the high temperature portion of the ACL unit when wiring the fan inside the ACL unit.

2> The phases of the AC input power to the main supply terminals L1, L2 and L3 must be same as those of the control power to the control power terminals L1AUX, L2AUX and L3AUX.
3> It is recommended to install the DC bus protection fuses on the both lines to terminals P an N to prevent ground fault, when plural number of load equipment is connected to the 8720MC-RPS Regenerative Power Supply.
4> Turn on the switch SW7-1 on the Regulator Board without fail.
5> Because driving current of sequence input signals is 5mA and below, use a contact of which minimum applicable load is 5mA and below.
6> Use the ACL unit in maximum surrounding air temperature of 55 °C (131 °F) and below.
7> Open all the terminals PR1, PR2 and PR3 for connecting precharge/discharge resistor. Because these terminals are open, the unit does not perform precharge/discharge operations. Precharge/discharge must be performed on inverter side. Set the parameter of the Discharging Function Enable (F.017) to zero (OFF).
8> If you want the 8720MC-RPS unit to perform the precharge/discharge operation, Install Jumper PR2 to PR3 and set Discharge Function Enable (F.017) to a one (ON).

It is possible to select the 8720MC-RPS units depending on the regenerative power when only regenerated power of the unit integrating converter and inverter is used. In this case, however, the following cautions must be observed. Figure 87 shows wiring of the 8720MC-RPS190 unit used as a converter for the power regeneration mode only.

- Rating of regenerative power of the 8720MC-RPS is less than rated power both in the instantaneous rating and continuous rating.
- When rectifier portion of inverter is composed of thyristor, CR snubber circuit between anode and cathode of thyristor may become overloaded. Therefore, treating time for regenerative power must be within 5 seconds for 3 minutes. Because the current "ICR" flowing through CR snubber circuit in the power regeneration mode is represented by the following formula, verify the specifications of CR snubber circuit.

  – $I_{CR}\,[A] \fallingdotseq (8 - 0.03 \times R\,[\Omega]) \times \sqrt{C\,[\mu F]}$

- Connect ACL unit of 3% impedance toward inverter rating with the AC input line of inverter. Without ACL unit, excessive circulating current will flow between the 8720MC-RPS units.
- Even during the power running, current will be supplied from the 8720MC-RPS unit to DC bus proportionally to the impedance ratio of both reactors at the 8720MC-RPS unit and inverter. This current must not exceed the rating of the 8720MC-RPS unit.
- Set the parameter of the FWD Current Limit (U.001) to zero (0).
- Set the DC bus voltage to start power regeneration to the parameter of the DC Bus Voltage Reference (U.000).
- Enter the READY signal of inverter to (PWR).

Precharge/Discharge Operation

- If you **do not want** the 8720MC-RPS unit to perform the precharge/discharge operation, open all the terminals (PR1, PR2, and PR3) for connecting the precharge/discharge resistor. In this case, the precharge/discharge must be performed on inverter side. Set the Discharging Function Enable parameter (F.017) to zero (OFF).

  or

- If you **do want** the 8720MC-RPS unit to perform the precharge/discharge operation, install a jumper from PR2 to PR3, and set the Discharge Function Enable parameter (F.017) to one (ON).

When Adapted to Capacitors Having Large Capacity

8720MC-RPS190 unit charges to capacitors with a single phase, full-wave rectification circuit through the built-in precharge/discharge resistor. When the load capacitors have large capacitance, it takes more time for charging, and the wattage of the internal resistor becomes insufficient. When the load capacitance is large, disable the built-in precharge/discharge resistor and connect an external resistor or external circuit for precharging/discharging (Note that minimum precharging/discharging cycle is 3 minutes).

Calculate a rated wattage of the external precharge/discharge resistor to be connected to the outside in accordance with the following formula depending on the total capacitance of all the capacitors including the built-in capacitor.

- Rated wattage [W] = 17000 x C[F]
- But, serge resistivity of J[J] = 28000 x C[F] must be provided.

When an external precharge/discharge resistor is connected, change the set value of the following parameters, if necessary.

- Precharge/Discharge Time (F.014)
- Wattage of Precharge/Discharge Resistor (F.015)

Table 37 - Maximum Applicable Capacitance of Capacitor and Minimum Resistance Value (8720MC-RPS190 unit)

Capacity of built-in Capacitor	7600µF
Built-in Resistor (Resistance Value/Wattage)	25000µF (10 ohm/400W)
External Resistor (Minimum Resistance Value), Connect to PR1 and PR2	165000µF (10 ohm)
External Circuit (Minimum Resistance Value), Refer to Figure 88.	495000µF (1.5 ohm)

External Resistor Case

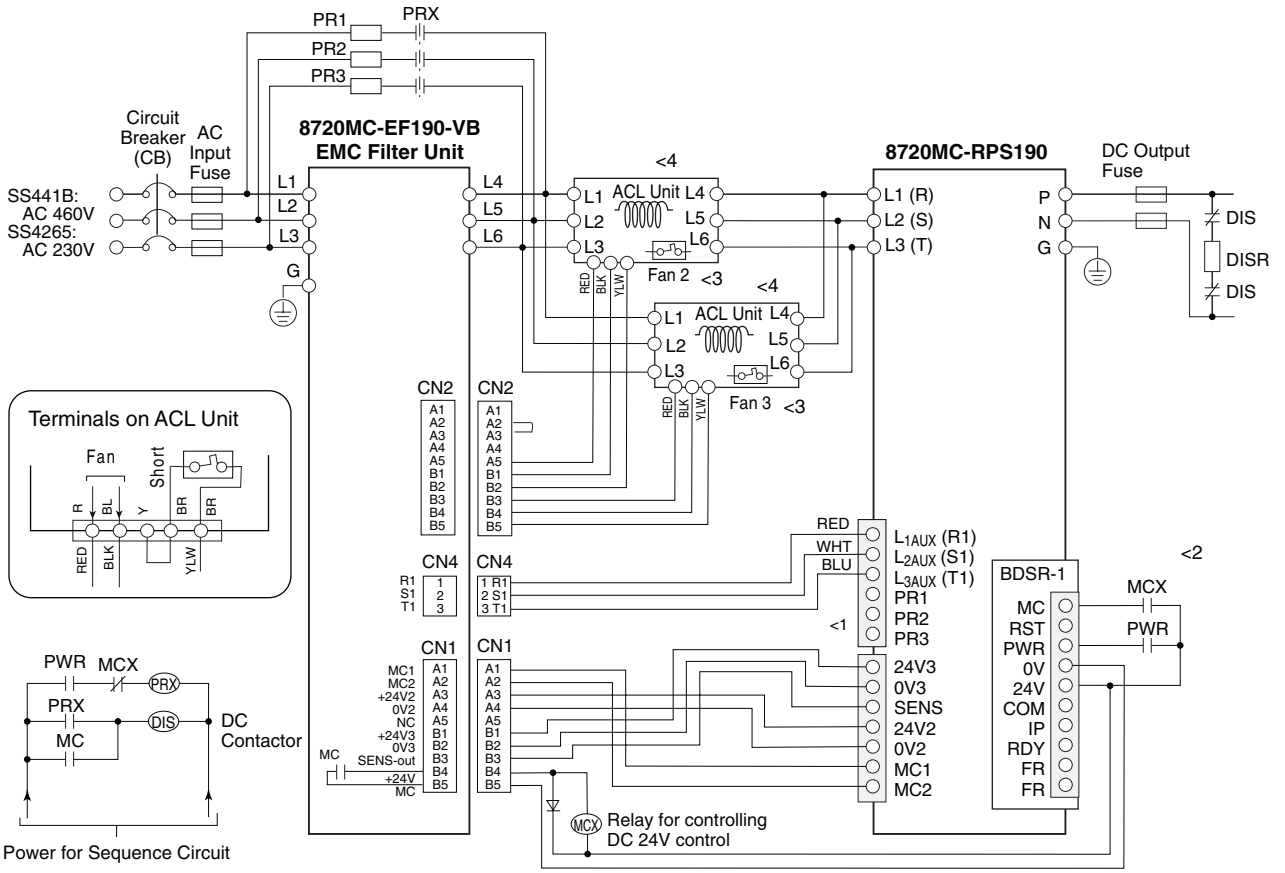
Most applications are successfully integrated using the internal precharge resistor provided in the 8720MC-RPS Regenerative Power Supply. For instances where there is a large amount of load capacitance, caused by connecting several 8720MC drives to a single 8720MC-RPS Regenerative Power Supply, an external precharge resistor may be required. To determine the total capacitance C[F] add the capacitance for the applicable RPS190 unit, as determined from row 1 of Table 37, to the sum of the drive capacitance as determined by the drive specifications in Chapter 2 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001.

In the case of the RPS190 if the total capacitance is above 25,000µf, but less than 165,000µf, an external precharge resistor connected to PR1 and PR2 is required. Table 37 provides the minimum resistance value for the external resistor of 10 ohms. The wattage is determined by the equation presented above. Connect the external precharge resistor to terminals PR1 and PR2 on the terminal block TB2. Terminal PR3 should be left open. See Figure 71 on page 85. The Precharge/Discharge Time (F.014) may require a larger value to accommodate the increased precharge time. The Wattage of Precharge/Discharge Resistor (F.015) should also be increased to the external precharge resistor wattage.

External Circuit Case

In the case of the RPS190 if the total capacitance is above 165,000µf but less than 495,000µf an external precharge resistor connected as shown in Figure 88 must be provided. Table 37 provides the minimum resistance value for the external precharge resistor, 1.5 ohms in the case of the RPS190. The wattage [W] is determined by the equation on page 118.

Figure 88 - Example of Wiring when Precharge/Discharge Circuit of the 8720MC-RPS190 is configured with an External Circuit



1> Remove the jumper between PR2 and PR3.

2> Use a relay with contact of which minimum applicable load is 5 mA and below.

3> Refer to the lower left corner of Figure 88 indicating the terminals on the ACL unit. When the fan inside the ACL unit is connected with an external power supply, do not fail to connect with the power supply designated by NEC Class 2 (Power supply limited to 100VA and below and 8A and below even in case of Error). Avoid the high voltage portion and the high temperature portion of the ACL unit when wiring the fan inside the ACL unit.

4> Use the ACL unit in maximum surrounding air temperature of 55 °C (131 °F) and below.

If a totally external resistor network is used as shown in Figure 88, the calculated wattage, [W] = 17,000 x C farads, is divided in half to size the precharge and discharge resistors.

Note: Parameter F.015 should be set to the sum of the wattage for both resistors.

Component Bill of Materials (Suggested)

Single Unit

Note: These suggested bill of materials are examples for the 8720MC-RPS190 units. Use these examples and the wiring diagrams to create a bill of materials for the 8720MC-RPS065 units.

Table 38 - Single 8720MC-RPS190 Suggested Components

Item [1]	Description	Qty
8720MC-RPS190BM	This is the 190 Amps DC output converter that powers the DC Bus.	1
Circuit Breaker (Allen-Bradley 140U-L6D3-D35) [2] [3]	• Circuit breaker is for a Circuit Break in the Main AC Line. • Supplemental contacts that are used in Power String of Master RPS.	1
Ferraz Shawmut or equivalent (Class J Fuses), 350 Amp AC Line [4] [3]	• AC input fusing for inrush needs. • RPS190 rated for 285 Amp because Maximum current allowed for 1 minute rating.[7]	3
Ferraz Shawmut A130URD71LL10350 DC Bus Fuses [4]	• DC Link output fusing to provide ground fault protection. • Recommended 1000 VDC rating. • RPS190 rated for 285 Amp because Maximum current allowed for 1 minute rating.[7]	2
8720MC-EF190-VB [5]	EMC Filter Unit which contains: • Main Line Filter • Magnetic Contactor • Varistor • Harmonic Filter Thermal sensing of 8720MC-LR10-100B Line Reactor and RPS	1
8720MC-LR10-100B [2]	• Contains one 100 A Reactor in the package; order quantity two for 200A capability • Parallel wiring required	2
100mm2 or 4/0 AWG recommended DC Bus wiring fit to length [6]	• DC Bus wiring. • Must be 1000 VDC rated • RPS fusing to 350 Amp so 100mm^2 or 4/0 AWG recommended • Keep DC Bus wiring as short as possible	Per fit

(1) Per page 2-9 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, or the equivalent.
(2) Refer to page 4-26 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.
(3) Circuit breakers with aux contacts are used when more than one RPS065Bx is used for interlocking purposes. See 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001 for more details. A circuit breaker OR AC Input fuses may be used based on required local code where the application is installed.
(4) Refer to page 4-27 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.
(5) Refer to page 4-28 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.
(6) Refer to Table 4.3 on page 4.2 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.
(7) Refer to Appendix A of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.

Two Paralleled Units

Table 39 - Multiple (Two) 8720MC-RPS190 Suggested Components

Item [1]	Description	Qty
8720MC-RPS190BM and 8720MC-RPS190BS	This is the 190 Amps DC output converter that powers the DC Bus.	1 (xBM) 1 (xBS)
Circuit Breaker (Allen-Bradley 140U-L6D3-D35) [2] [3]	• Circuit breaker is for a Circuit Break in the Main AC Line. • Supplemental contacts that are used in Power String of Master RPS.	2
Ferraz Shawmut or equivalent (Class J Fuses), 350 Amp AC Line [4] [3]	• AC input fusing for inrush needs. • RPS190 rated for 285 Amp because Maximum current allowed for 1 minute rating.[7]	2 sets (total 6)
Ferraz Shawmut A130URD71LL10350 DC Bus Fuses [4]	• DC Link output fusing to provide ground fault protection. • Recommended 1000 VDC rating. • RPS190 rated for 285 Amp because Maximum current allowed for 1 minute rating.[7]	2 sets (total 4)
8720MC-EF190-VB [5]	EMC Filter Unit which contains: • Main Line Filter • Magnetic Contactor • Varistor • Harmonic Filter Thermal sensing of 8720MC-LR10-100B Line Reactor and RPS	2
8720MC-LR10-100B [2]	• Required for boosting up and controlling DC Bus Voltage • Contains one 100 A Reactor in the package; order quantity two for 200A capability • Parallel wiring required	4
DC Bus bar wiring fit to length [6]	• DC Bus connection. • RPS suggestion to use bus bar rated to at least 175% of RPS output Amps; In this case, 570 A x 1.75, or 997.5 A • Must be 1000 VDC rated • Keep DC Bus wiring as short as possible	Per fit

(1) Per page 2-9 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, or the equivalent.
(2) Refer to page 4-26 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.
(3) Circuit breakers with aux contacts are used when more than one RPS065Bx is used for interlocking purposes. See 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001 for more details. A circuit breaker OR AC Input fuses may be used based on required local code where the application is installed.
(4) Refer to page 4-27 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.
(5) Refer to page 4-28 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.
(6) Refer to Table 4.3 on page 4.2 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.
(7) Refer to Appendix A of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.

Three Paralleled Units

Table 40 - Multiple (Three) 8720MC-RPS190 Suggested Components

Item [1]	Description	Qty
8720MC-RPS190BM and 8720MC-RPS190BS	This is the 190 Amps DC output converter that powers the DC Bus.	1 (xBM) 2 (xBS)
Circuit Breaker (Allen-Bradley 140U-L6D3-D35) [2] [3]	• Circuit breaker is for a Circuit Break in the Main AC Line. • Supplemental contacts that are used in Power String of Master RPS.	3
Ferraz Shawmut or equivalent (Class J Fuses), 350 Amp AC Line [4] [3]	• AC input fusing for inrush needs. • RPS190 rated for 285 Amp because Maximum current allowed for 1 minute rating.[7]	3 sets (total 9)
Ferraz Shawmut A130URD71LL10350 DC Bus Fuses [4]	• DC Link output fusing to provide ground fault protection. • Recommended 1000 VDC rating. • RPS190 rated for 285 Amp because Maximum current allowed for 1 minute rating.[7]	3 sets (total 6)
8720MC-EF190-VB [5]	EMC Filter Unit which contains: • Main Line Filter • Magnetic Contactor • Varistor • Harmonic Filter Thermal sensing of 8720MC-LR10-100B Line Reactor and RPS	3
8720MC-LR10-100B [2]	• Required for boosting up and controlling DC Bus Voltage • Contains one 100 A Reactor in the package; order quantity two for 200A capability • Parallel wiring required	6
DC Bus bar wiring fit to length [6]	• DC Bus connection. • RPS suggestion to use bus bar rated to at least 175% of RPS output Amps; In this case, 570 A x 1.75, or 997.5 A • Must be 1000 VDC rated • Keep DC Bus wiring as short as possible	Per fit

(1) Per page 2-9 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, or the equivalent.
(2) Refer to page 4-26 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.
(3) Circuit breakers with aux contacts are used when more than one RPS065Bx is used for interlocking purposes. See 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001 for more details. A circuit breaker OR AC Input fuses may be used based on required local code where the application is installed.
(4) Refer to page 4-27 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.
(5) Refer to page 4-28 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.
(6) Refer to Table 4.3 on page 4.2 of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.
(7) Refer to Appendix A of the 8720MC Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for more information.

Parameter Programming

1336 REGEN Line Regenerative Package

Overview

The 1336 REGEN Line Regeneration Package is designed so that factory default parameter settings allow it to operate satisfactorily under a wide variety of load and utility conditions.

IMPORTANT The 1336 REGEN Package has been shipped from the factory with Parameter 1 set to the Regenerative Brake Mode of operation. For Regenerative DC Bus Supply applications, this parameter must be reset as described in "Operational Mode" on page 2-29 of the 1336 REGEN Line Regeneration Package User Manual, publication 1336 REGEN-5.0.

With the exception of Parameter 1, for the majority of applications there should be no need to adjust parameters. Should utility or load conditions deviate from the normal conditions listed in the specifications, the following parameters have been provided to allow adjustments to factory settings.

Parameters

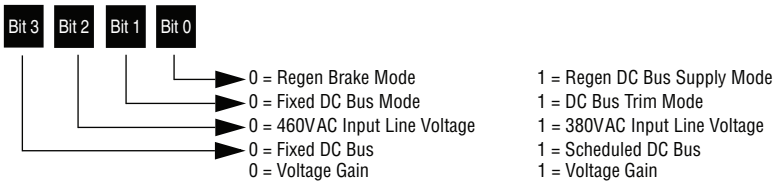
Figure 89 - 1336 REGEN Parameters Description

```
Operational Mode
XXXX0000      1
```

Parameter No.	1
Display Units	bits
Parameter Type	Read/Write
Factory Default Regen Brake Mode	XXXXX000
Min/Max Value	N/A
Drive Units	000 = 0_{bin}

Operational Mode

Sets the 1336 REGEN Line Regeneration Package mode of operation. The modes are defined by the last (3) bits of a 16 bit word. To set the mode, first stop the 1336 REGEN Converter, set the mode, then re-enable the converter.



Important: If the **[Operational Mode]** is reset while the 1336 REGEN Converter is enabled, a System Mode Change Fault will occur. Issuing a reset command will clear the fault and reset the converter.

Table 41 - 1336 REGEN Line Parameter Examples

Parameter Number	Parameter Name	Engineering Units	Engineering Min	Engineering Max	Default Values
1	Operational Mode		00000000B	00001111B	00000000B
2	Rated AC Line Current	AMPS	0.1	6553.5	0.1
3	AC Line Current	%	-800	800	0
4	Peak Load	%	-800	800	0
5	Actual Bus Voltage	VOLT	0	2496.1	0
6 (1)	Bus VReg Ref.	VOLT	664.2	775	738.1
7 (1)	Bus VReg KP		0.5	1.99	1
8 (1)	Bus VReg KI		0.5	1.99	1
9 (2)	Conduction Angle Constant		0.5	0.55	0.5
10 (2)	Shift Angl Constant		0	0.06	0.03
11 (2)	Inst. Overcurrent Trip Filter		0	10	5
12 (1)	Motoring Cur Lim	%	0	150	150
13	Regen Curr Limit	%	-150	0	-150
14	Inst. Overcurrent SW Trip Level	%	100	199	192
15	Voltage Feedback Filter Bandwidth	HZ	5	100	10
16	DC Bus Overvoltage SW Trip Level	%	120	135	130
17	DC Bus Undervoltage SW Trip Level	%	50	100	60
18	AC Line Overvoltage Trip Level 1	%	110	130	115
19	AC Line Overvoltage Trip Level 2	%	120	135	130
20	AC Line Undervoltage Trip Level 1	%	75	90	85
21	AC Line Undervoltage Trip Level 2	%	50	70	60
22	Phase Locked Loop Error Trip Point		0	0.3	0.1
23	Port Enabled Mask		00000000B	00000111B	00000111B
24	Start / Stop Owner		0000000000000000B	1111111111111111B	0000000000000000B
25	Command Status		00000000B	11111111B	00000000B
26	Logic Status		00000000B	11111111B	00000000B
27	Fault Select 1		00000000B	00011111B	00011100B
28	HIM Default Display Parameter		1	32	5
29	DAC Select 1		1	25	3
30	DAC Select 2		1	25	4
31	DAC Select 3		1	25	5
32	DAC Select 4		1	25	6

(1) Specific to DC Bus Supply Operation
(2) Specific to Regenerative Brake Operation

Note: The parameters in Table 41 are from DriveExecutive, using a 336R Line Regen, 480V/48.2A Series A, Version 2.02.

Refer to the 1336 REGEN Line Regeneration Package User Manual, publication 1336 REGEN-5.0, pages 2-28 to 35 (Regenerative DC Bus Supply Operation Parameters) and pages 3-33 to 3-40 (Regenerative Brake Operation Parameters) for parameter details.

8720MC Regenerative Power Supply

Overview

The parameters are used to define characteristics of the 8720MC-RPS Regenerative Power Supply. To program the unit for a specific application, you display the appropriate parameter and adjust it as required.

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should adjust and operate this equipment. Read and understand this manual in its entirety before proceeding. Failure to observe this precaution could result in destruction of the equipment, severe bodily injury or loss of life.

There are two types of parameters:

- User Parameters (U.XXX)
  - These parameters can be adjusted or modified at any time.
- Factory Parameters (F.XXX)
  - These parameters are initially set before shipping out from the factory. Usually, these parameters are not required to be adjusted or modified.

The Factory parameters are protected by password, and the password must be set to access these parameters. Note, however, that some of these parameters cannot be modified during operation even though the password has been set.

Parameters

Table 42 - 8720MC-RPS Parameter Examples

Parameter Number	Parameter Name	Engineering Units	Engineering Min	Engineering Max	Default Values
U.000 (1)	DC Bus Voltage Reference	Volts	270	750	700
U.001 (1)	FWD Current Limit	%	0	150	150
U.002	REV Current Limit	%	0	150	150
F.000	Password		0	999	0
F.001	Unit Selection	Amps	027.b	570.b	Unit-Dependant: 027.b 054.b 081.b 065.b 130.b 195.b 190.b 380.b 570.b
F.002	Rated Current	Amps	10	645	Unit-Dependant: 27 54 81 65 130 195 190 380 570
F.003	Current Control Proportional Gain	Times	0.01	10	1
F.004	Current Control Integral Gain	rad/sec	1	3000	64
F.005	Voltage Control Proportional Gain	Times	0.01	30	5
F.006	Voltage Control Integral Gain	rad/sec	1	3000	128
F.007	Bus Overvoltage Detection Level	Volts	325	900	800
F.008	Bus Low Voltage Detection Level	Volts	200	600	400
F.009	AC Overvoltage Detection Level	Volts	200	550	550
F.010	Carrier Frequency	kHz	5	15	10 kHz: 8720MC-RPS065 5 kHz: 8720MC-RPS190
F.011	Deadtime	microseconds	1.5	15	6
F.012	Allowable Time for Instantaneous Power Loss	seconds	0.05	3	0.5

Parameter Number	Parameter Name	Engineering Units	Engineering Min	Engineering Max	Default Values
F.013	AC Reactor Capacity	micro-henry	100	8000	1200mH: 8720MC-RPS065 400mH: 8720MC-RPS190
F.014	Precharge/Discharge Time	seconds	0.5	15	3.0 secs 6.0 secs: 8720MC-RPS190
F.015	Wattage of Precharge/ Discharge Resistor	Watts	50	2000	120W: 8720MC-RPS065 400W: 8720MC-RPS190
F.016	DC Bus Voltage Offset	Volts	0.9	1.1	1
F.017 (1)	Discharging Function Enable		Off	On	On
F.018	Version Information				
F.019	Selection of Wiring (LE) Detecting Function		Off	On	On

(1) Important Parameter Programming when in Power Regeneration Mode Only. Set U001 to 0 so converter power is not forwarded to the drive. U000 is important in any function that regulates the DC bus level.

Note: Refer to Chapter 7 - Parameters, of the 8720MC-RPS Regenerative Power Supply Installation Manual, publication 8720MC-RM001, for each parameter described in detail.

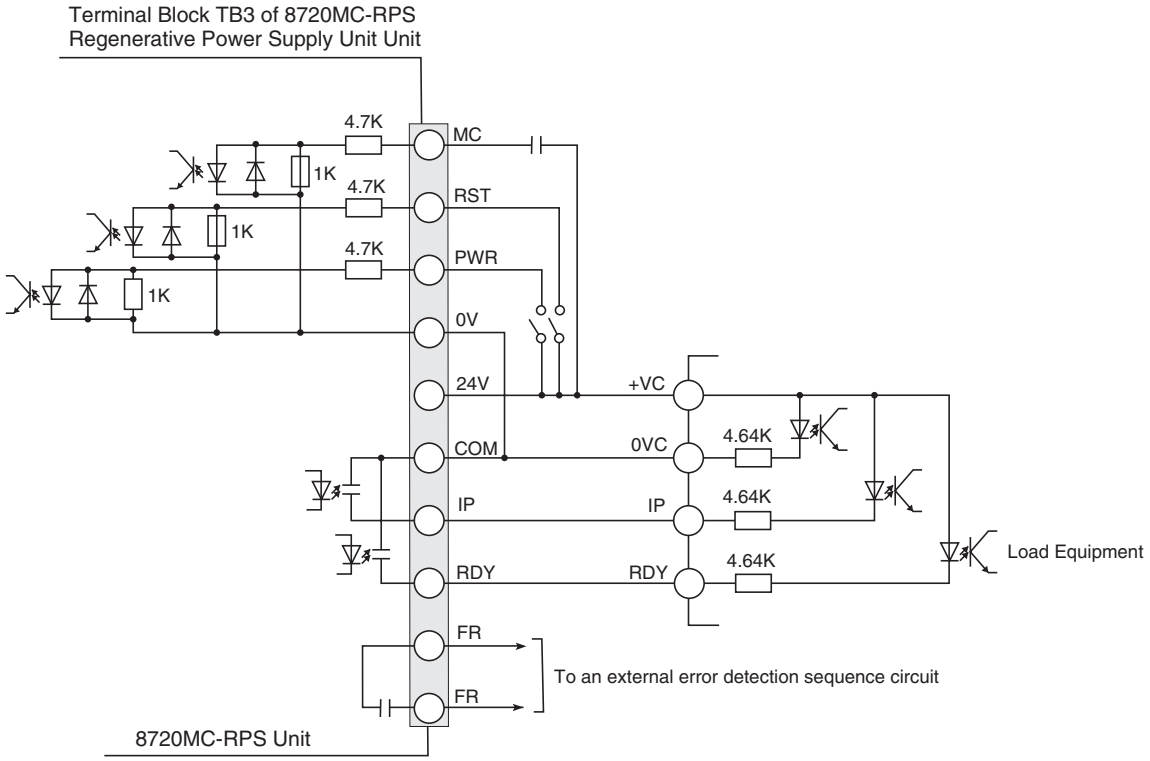
Notes:

Sequence of Operation

8720MC-RPS: Sequence Signal Wiring

Figure 90 shows a typical connection of sequence control signals.

Figure 90 - 8720MC-RPS Typical Connection of Sequence Control Signals



Sequence Signal Wiring

Verify the following when installing sequence signal wiring:

- Twisted pair wires of 0.2 to 0.5 mm2 should be used for the signal line.
- Verify that the sequence signal wiring is separated from the power wiring (main power supply wiring, control power wiring and DC bus power wiring). Malfunction of the 8720MC-RPS Regenerative Power Supply is possible if the control wires are separated from the AC and DC power wires.
- Use a separate duct for the sequence signal wiring. It is recommended to use a dedicated duct for the sequence signal wiring.
- Do not route the sequence signal wiring near any equipment which is producing electromagnetic interference.

Operation Timing of Sequence Control Signals

Figure 91 through Figure 96 show timing of various sequence control signal operations.

Figure 91 - Sequence Operation of Precharging

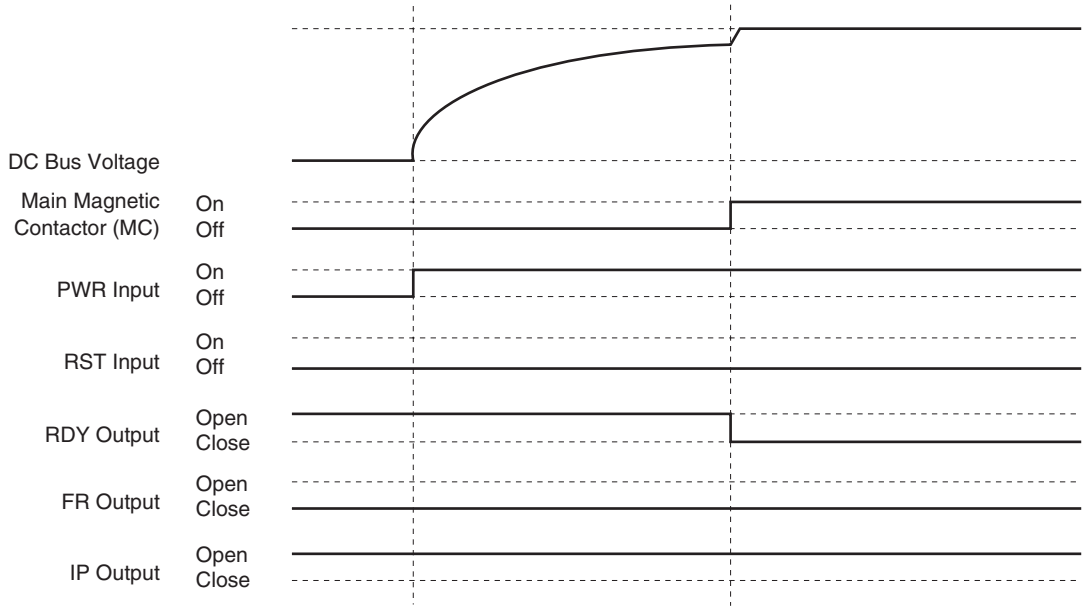


Figure 92 - Sequence Operation of Discharging

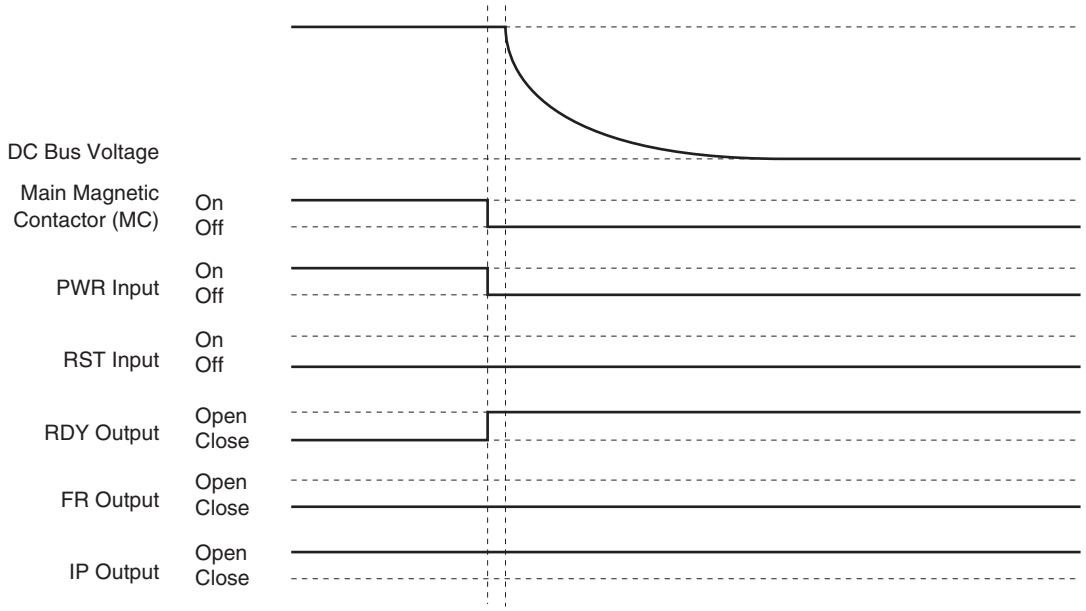


Figure 93 - Sequence Operation of Error Detection

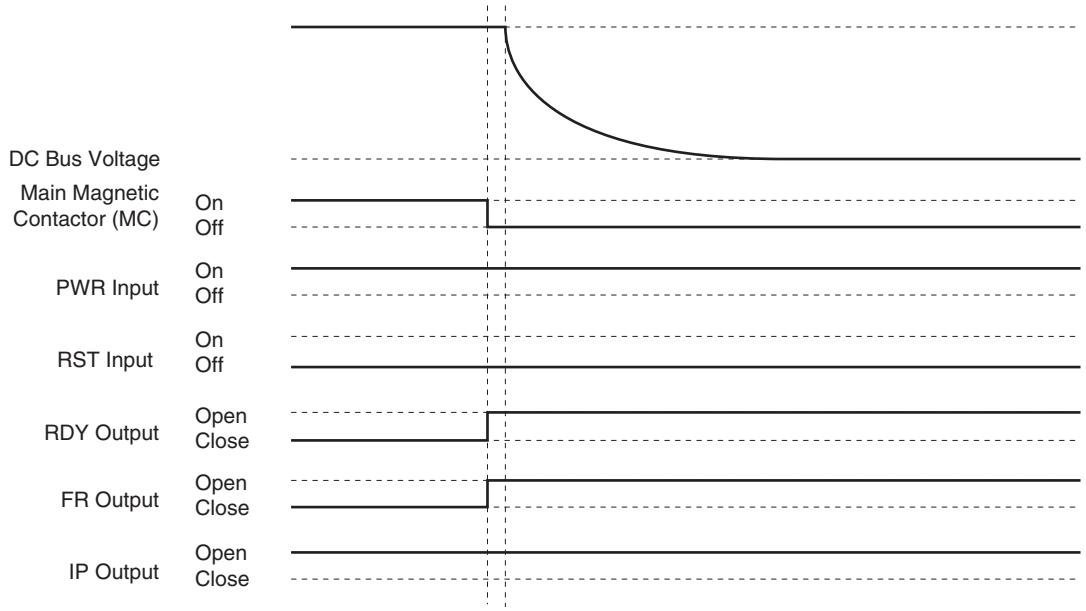


Figure 94 - Sequence Operation of Resetting Error

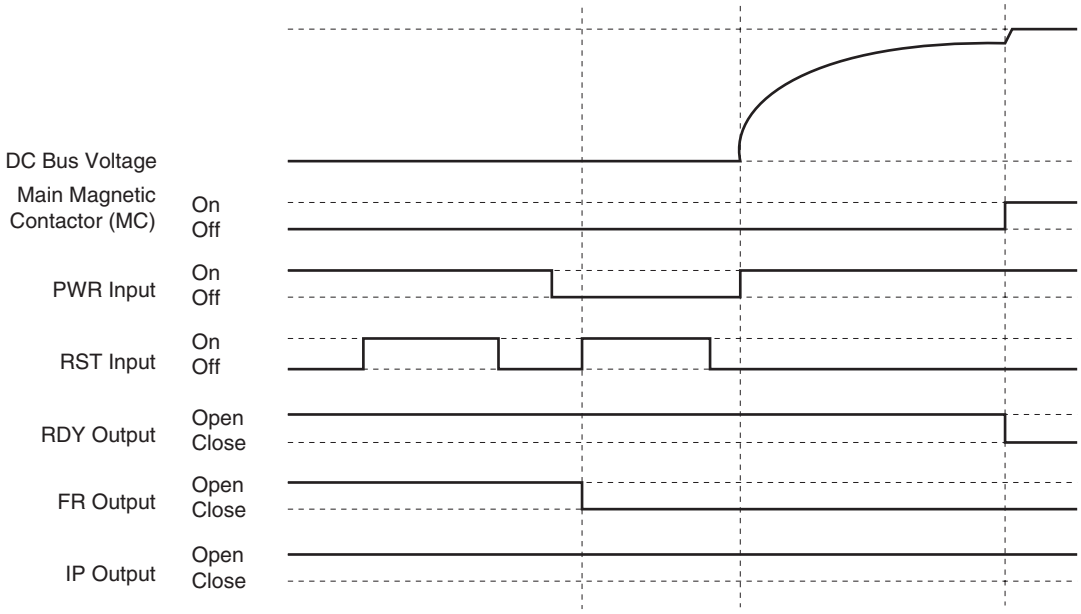


Figure 95 - Sequence Operation of Detecting Instantaneous Power Loss (When Main Magnetic Contactor is not Turned OFF)

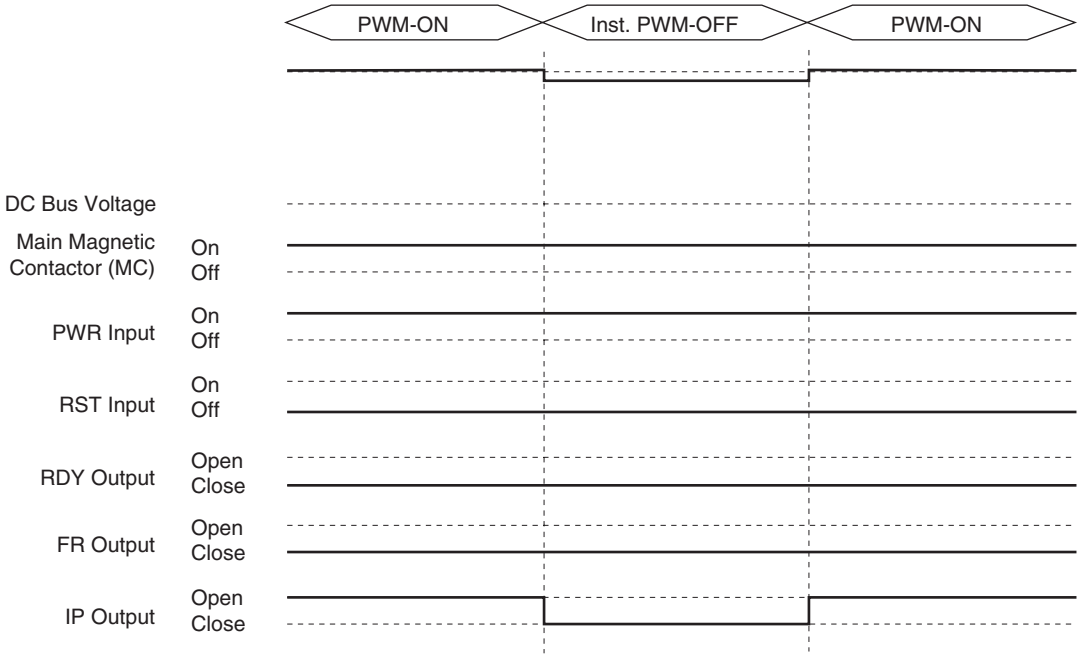
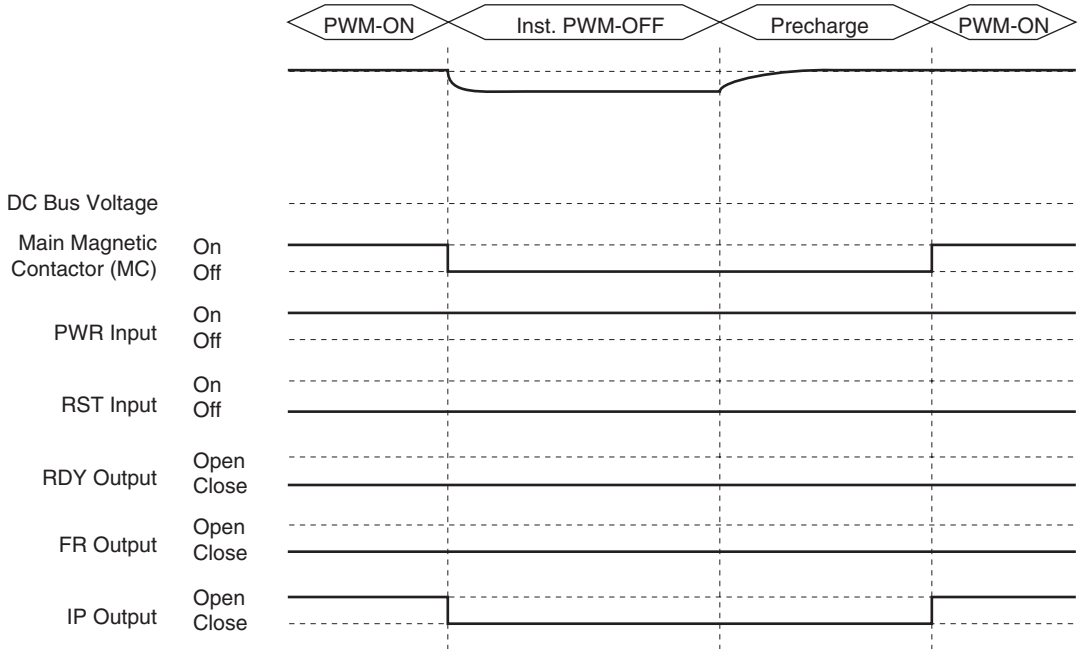


Figure 96 - Sequence Operation of Detecting Instantaneous Power Loss (When Main Magnetic Contactor is Turned OFF)



Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products.
At http://www.rockwellautomation.com/support/, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/support/.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

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